AN EPIDEMIOLOGICAL STUDY OF ANAEMIA OF PREGNANCY IN A RURAL POPULATION OF PRIMARY HEALTH CENTRE

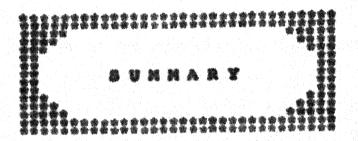
KOCHHABHANWAR DISTRICT JHANSI, UTTAR PRADESH

(SUMMARY)

THESIS
SUBMITTED FOR THE DEGREE OF
DOCTOR OF MEDICINE
(SOCIAL AND PREVENTIVE MEDICINE)

BUNDELKHAND UNIVERSITY JHANSI, UTTAR PRADESH.

M. K. SHUKLA





Anaemia is one of the important preventable health problems affecting the women of child hearing ages. It is notorious for its deleterious effects during pregnancy, on mother as well as on foetus. It is often associated with high maternal and foetal mortality, besides morbidity.

Anaemia is a pathological condition in which the haemoglobin level is reduced, below the normal limits for age and sex of the individual. The term 'aneemia of pregnancy' is somewhat different from that of anaemia in pregnancy; the former takes into consideration only those types of anaemia which are directly caused or precipitated by pregnancy while the latter includes all the types irrespective of its actiology.

In view of graveness and high magnitude of the problem in rural pregnant women, a longitudinal study on anaemia was undertaken under domiciliary conditions in a rural community of district Jhansi (Uttar Pradesh) with the following objectives.

 To find out the extent of problem of aneonic of prognancy in the area considered.

- To investigate the association of various socioeconomic and demographic factors, lactation and dietary habits with the prevalence of anaemia, if any.
- 3. To suggest some measures, based on the conclusions of the study, for the control of anaemia of pregnancy in the area.

A total of 246 pregnant women belonging to different trimesters of pregnancy were studied for the purpose. An equal number of non-pregnant women, belonging to same socio-economic status, parity and age-group, acted as control.

control were subjected to a detailed examination consisting of general interrogation, history taking, general and systemic examination, hasmatological investigations and diet survey. In women initially belonging to first and second trimesters of pregnancy, a follow-up survey was also conducted, at an average interval of 3 months, to study the hasmatological changes and incidence rate of anaemia. A pregnant woman was considered to be shaemic when she had her hasmaglobin level below 11 gm, percent; a cut-off point of 12 gm. percent was, however, considered for non-pregnant women (w.H.O., 1966). The findings of the study may be summarised as under :

- 1. The overall prevalence rates of anaemia were 68 percent and 25 percent in pregnant and nonpregnant wemen respectively. This indicated that in about 43 percent women, anaemia was directly caused or precipitated by pregnancy.
- 2. Follow-up investigation of women belonging to early pregnancy, revealed an overall net incidence rate of 44 percent, indicating the extent of afresh development of this condition in pregnant women during a pariod of about 3 months.
- 3. The prevalence as well as incidence rates of anaemia showed an increasing trend with advancing prognancy; the highest prevalence rate being in woman belonging to third trimester. It indicates that for comparison of prevalence of anaemia in 2 groups of pregnant woman, the groups need to be homogeneous in respect of gestational age. Of course, the criteria adopted for the diagnosis of anaemia must be uniform.
- 4. Microcytic hypochromic anaemia was commonent amongst various morphological types prevalent in the area in the two groups. It indicates that the majority of upmen were suffering from anaemia due to iron deficiency. A small percentage of pregnant women the were anaemic showed macrocytic changes too indicating that folic sold and Vit. B₁₂ deficiencies also play some role in the causation of anaemia of pregnancy.

- 5. Amongst the socio-economic factors, literacy and social status of the women were found to be significantly associated with anaemia in the two groups. Literacy status of husbands had a significant role in the determination of ensemia in a population.
- 6. Provalence of anaemia in both the groups increased with the increasing age of the woman. It was higher in woman who had relatively early ages at consummation and were multigravidae. Provalence of anaemia among prognant woman was also significantly affected by age at marriage, age at first child birth and space between last child birth and present pregnancy.
- 7. Prolonged breast feeding to the last child was found to have significant effect on the prevalence of anaemia neither in study nor in control groups.
- determination of prevalence rates of anaemia in the two groups. Such a rate showed a consistent increase with increasing intake of iron, folic acid and Vit. B₁₂.

On the basis of the findings portrayed above, some recommendations may be made for effective control of ensemis in population commensurating in nature with the present one.



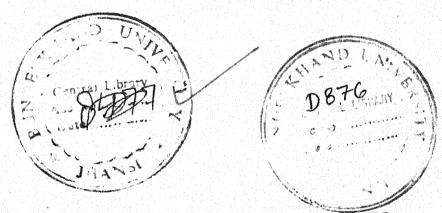
- 1. The Vulnerable group of pregnant women vis. elderly, multigravidae and those with short spaces between last child birth and present pregnancy should be given priority in anaemia control programmes; an attempt should be made to cover all such women specially during later half of their pregnancy.
- Role of nutritious diet, prepared from locally available cheap food articles should be emphasized to all the women of child bearing ages.
- 3. Mass education should be provided to stop early marriages in the community; ages at marriage and at consummation should be enhanced, as far as possible, to avoid early pregnancies.
- 4. Family welfare programme should lay down emphasis on the role of planned families in reducing the prevalence of anaemia.

Most of the socio-economic and demographic factors studied by us influence the prevalence of anaemia in non-prognant women also. Thus, it is expected that by adopting the recommendations, mentioned above, the hasmoglobin level of all the women of child bearing ages would improve thus making them less susceptible for anaemia during successive prognancies.

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M. K. SHUKLA

GERALFI CATE

Certified that the research work submitted by Mahesh Kumar Shukla, entitled "An Spidemiological Study of Anaemia of Pregnancy in a Rural Population of Primary Health Centro, Kochha Bhanwar, District Jhansi, Uttar Pradesh" was conducted by the candidate under our supervision and the techniques and statistics mentioned in the thesis were actually undertaken by him.

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(MANESH KUMAR SHUKLA)

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INTRODUCTION

A healthy mother is expected to give birth to a healthy and normal child. Furthermore, children born to malnourished mothers remain at a high risk of developing malnutrition. Thus, by improving health status of pregnant women, a corresponding improvement in the health of future new borns can well be expected.

Amongst various nutritional disorders affecting women of child-bearing ages all over the world, anaemia holds a top position. It is known to cause widespread ill effects on the pregnancy and its outcome. Anaemia is a general indicator of poor health and is closely linked with poverty and mainutrition. It is well prevalent in both developed and developing countries; former are facing the problem much more than the latter (Kothari and Shende, 1949; Shanker, 1962; Steingold, 1966 and Dawn, 1973).

Anaemia is considered as a condition of reduction in the concentration of haemoglobin in the peripheral blood below the normal for the age and sex. According to Srslev (1977), it is a condition, characterized by a haemoglobin concentration below normal level, in which the patient suffers from tissue hypoxia due to low oxygen carrying capacity of the blood.

The term 'anaemia of pregnancy' is infact different from 'anaemia in pregnancy'. While former deals with only those types of anaemia which appear for the first time during pregnancy, the latter includes its all forms, irrespective of the origin. The general preventive measures, to fight against the problem of anaemia among pregnant women, can best be applied against the problem of 'anaemia of pregnancy'. This is because the anaemia occurring due to associated pathological conditions require additional treatment, specific for the associated conditions.

The clinical manifestations and complications of anaemia associated with pregnancy have been documented since long. In about 1500 B.C., a disease characterized by pallor, dyspacea and cedema had been described in the 'Papyrus Ebers', an Egyptian Manual of Therapeutics, believed to be the oldest complete medical manuscript (Bryan, 1931). In India, Charak (200 A.D.) had also described a disease with similar characteristics with the name of 'Pandu Roga', in a text book of Indian medicine - 'The Charak Samhita'.

Pregnancy imposes extra nutritional demands on the mother end is likely to unmask any latent deficiency state. In Indian society, a repeated quick succession of child birth further enhances this effect. Defore a woman recoups her reserves from the strains put upon her by the past pregnancy, she is thrust upon with a second conception thus, leading a further increase in her deficiency.

The graveness of the problem can be judged by its consequences. Many workers have reported anaemia of pregnancy to be the one of the important contributing factors in maternal deaths; in some cases it has been directly responsible for such deaths (Menon, 1967; Khanam at al, 1979; Sikder and Konar, 1979). Incidence of toxaemia of pregnancy is also considerably higher in anaemic women than in non-anaemics (Chaudhury, 1970).

There has been a positive correlation between the maternal haemoglobin level and foetal birth-weight (Yusufji, 1973). The neonatal and perinatal loss is very high in severely ansemic mothers (MacGregor, 1963; Mittal and Ketkar, 1970). Even milder degree of ansemia may be detrimental. Such ansemia has been shown to be associated with premature delivery, lower birth-weight and placental hypertrophy (Baker, 1978).

Lack of iron in diet and increased iron demands during pregnancy are the major causes of iron deficiency in pregnant women (W.H.O., 1970). However, the relatively recent detection of folic acid deficiency in pregnant women as a definite entity has positively led to an improvement in the management and prognosis of ansemia.

During pregnancy, folate requirement in women is thought to be considerably high due to rapid cell multiplication (w.H.O., 1975).

In recent years, the prevalence of anaemia of pregnancy has shown considerable geographical variations. Studies conducted in collaboration with the Pan American Health Organization (Cook, 1969) envisaged prevalence rates varying from 22.0 percent to 62.7 percent in various countries of Latin America. In a study carried out in collaboration with World Health Organization (1968) in different countries of the world, it was revealed that the prevalence rate of anaemia among pregnant women varies from a minimum of 20 percent in Poland to a maximum of 80 percent in India.

In India, a study conducted in Hydershad showed an overall prevalence of anaemia of 46 percent amongst women attending antenatal clinic (Shanker, 1962). In another study (Sood, 1967), in Delhi and surrounding villages, it was observed that the prevalence of anaemia of pregnancy is higher among ruralites than urbanites.

The variation in the prevalence of ensemia, by and large, depends on the standards used for selecting the cases, criteria used for labelling a case as ensemic or otherwise, variation in the population due to geographical characteristics, various socio-cultural

factors associated with it and nutritional status of the population (Menon, 1967). However, many factors, contributing significantly in such variation could not be brought forth hitherto. There is need to carry out studies to investigate relevant factors and their contribution in the variation of prevalence of anaemia within and between countries.

Lacunse in the knowledge

Though, some studies on anaemia and its various associated epidemiological factors have been carried out so far, however, the literature on the subject is still very scanty. Further, studies from developing countries like India, where anaemia of pregnancy poses a great problem, have been very few. Available studies are mostly hospital based, providing a little or no information regarding the epidemiological features of the problem of anaemia of pregnancy. In India field based studies particularly, those dealing with rural populations where its prevalence is significantly higher than urbanites (Mac Fee, 1973; I.C.M.R., 1975) are, in fact, rare.

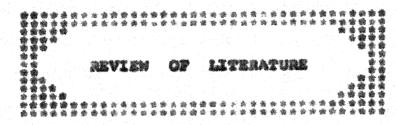
Further, certain correlative factors of anaemia like age, gestational age and parity etc. have extensively been studied but many other important factors such as - lactation, socio-economic status, spacing, age at marriage, literacy status of the mother and of husband, size of the

family and occupation of husband etc. have not been studied much for their contribution, if any, in the prevalence of anaemia of pregnancy. Therefore, there seems a need to investigate these factors for their relevant contributions.

with above in view, a door to door follow up investigation on anaemia of pregnancy was carried out in a rural population of Primary Health Centre, Kochhabhanwar, a Rural Health Training Centre of the Department of Social and Preventive Medicine, M.L.B. Medical College, Jhansi, Uttar Pradesh during April to November, 1980.

The objectives of the study were :

- To find out the extent of problem of anaemia of pregnancy in a rural population of Primary Health Centre, Kochhabhanwar, District Jhansi, Uttar Pradesh.
- 2. To investigate the ansociation of various factors, like - age, literacy status of the couple, religion, socio-economic status, age at marriage, parity, spacing, lactation and dietary factors with the prevalence of ansemia, if any.
- To suggest suitable measures for the control of ensemis of pregnancy in the area as far as possible.



REVIEW OF LITERATURE

GENERAL CONSIDERATIONS

(i) <u>Definition</u> of Angemia

The term anaemia has been defined as 'diminution in the oxygen-carrying capacity of blood or, in other words, diminution below normal in the total circulating haemoglobin mass' (Steingold, 1966). The haemoglobin concentration is accepted as one of the indicators for the qualitative and quantitative assessment of anaemia, in general. Degruchy (1978) defined anaemia as 'a condition of reduction in the concentration of haemoglobin in the peripheral blood below normal for the age and sex of the patients'.

The term 'anaemia in pregnancy' refers to all forms of anaemias, that are encountered during pregnancy. The term 'anaemia of pregnancy', however, includes only those which appear for the first time during pregnancy and are directly precipitated or caused by pregnancy (Chatterjee, 1971).

(11) Concept of Physiological Ansemia

In pregnancy, the disproportionate increase of plasma volume causes blood dilution and hence, inspite of a simultaneous increase in red cell mass, a fall in haemoglobin level results. This state of haemodilution is often referred as physiological ansemia (Stoingold, 1966).

various workers have expressed contradictory opinions regarding the presence of physiological amaemia. The studies conducted by Dieckmann and Wegner (1934), Berlin et al. (1953), Land and Sisson (1958), Lawrence (1962) and Paintin (1962) supported the concept of physiological anaemia, whereas those conducted by Benstead and Theobald (1952), Davis and Jennison (1954), Fisher and Biggs (1955), Edger and Rice (1956) and Giles and Burton (1960) did not give any credence to it.

Dieckmann and Wegner (1934) were amongst the earliest workers reporting the changes in blood volume during pregnancy. They observed that the increase in red cell mass and red cell volume was comparatively less than the increase in plasma volume. Thus a fall in the haemoglobin and red cell concentration occurs, though there is no true anaemia. They further observed that at about 30th week of pregnancy, when the haemodilution was most marked, the average fall in heemoglobin concentration was 2.2 cm. per 100 ml. (15 percent). From these observations, authors conclude that presence of true anaemia can not be detected in the later stages of pregnancy until the heemoglobin concentration falls below 10 gm. percent. A considerable individual variation was observed by the authors in these volume changes during the course of pregnancy; a few women, however, did not show any significant change.

physiological anaemia on the basis of results of a therapeutic trial which revealed that iron intake throughout pregnancy had no effect on anaemia, as the provalence of anaemia was found to be similar to that reported by Caton et al (1951) who did not give any iron to pregnant women of their study.

Lund and sisson (1958) found that pregnant women show lower packed cell volumes and haemoglobin concentrations with higher total red cells and haemoglobin than those of non-pregnant women. The studies conducted by Lowrence (1962) and Paintin (1962) revealed that the increase in red cell volume is not dependent on iron therapy and occur even in women who are not given iron. Nevertheless, iron deficiency limits this increase and may even cause a fall. It also has a limiting effect on the plasma volume increase.

Bensteed and Theobald (1952) did not agree with the concept of physiological anaemia, on the basis of their study which revealed that oral iron maintains the haemoglobin concentration in pregnancy. However, the majority of their patients were anaemic when iron therapy was commenced. Similar observations have been made by Davis and Jennison (1954).

Fisher and Biggs (1955) gave oral iron to

104 pregnant women and found that 92 of them responded

while 12 did not, the criterion of response being a
haemoglobin level of 12.6 gm. per 100 ml. at 38 weeks.

In a similar study by Edger and Rice (1956) proportion of
non-responders has been found to be 22.4 percent. They
explained that patients showing no response, probably,
did not take their iron or failed to absorb it. Giles
and Burton (1960) found that about 8 percent of their
patients showed no response to iron therapy during
pregnancy.

In mutshell, above observations suggest that
the iron therapy would be effective in most of the women
and will maintain the haemoglobin concentration at 12.6 gm.
per 100 ml. or more,or raise it to such a level if there
has been significant initial anaemia. In remaining, there
would be no such apparent response. In these cases,
however, the response might occur but masked by greater
plasma volume increase (Lawrence, 1962).

(111) Criteria for the Diagnosis of Anaemia in Pregnancy.

Varied criteria for diagnosis of anaemia in pregnancy have been used by different workers (Adair <u>et al</u>, 1936; Das Gupta, 1954; Menon, 1967; Gajwani <u>et al</u>, 1969). Such criteria differ between countries (Solomons <u>et al</u>, 1962; Paintin, 1962; Das <u>et al</u>, 1977 a) and also between workers within countries (Chaudhury, 1939; Sood, 1967).

Adair et al (1936) recommended a haemoglobin level of 10 gm. percent as cut off point below which all the pregnant women should be considered anaemic. Solomons et al (1962) adopted haemoglobin level of 11.8 gm. percent for the purpose. Benjamin et al (1966), however, used the level of 12 gm. percent as cut off point.

In India, few workers used a very low haemoglobin level for diagnosing anaemia in pregnant women. The minimum normal value of haemoglobin reported by Das Gupta (1954) was 9.5 gm. percent. Menon (1967) used a level of 8.8 gm. percent, while Chaudhury and Manglik (1938) and Chaudhury (1939) considered a cut off point of 7.3 gm. percent.

However, most of the recent workers have considered a haemoglobin level of either 10 gm. percent (Rami <u>et al</u>, 1962; Shanker, 1962; Venkatachalam, 1962; Gajwani <u>et al</u>, 1969) or 11 gm. percent (Subramanian and Fernandes, 1970; Chopra <u>et al</u>, 1971; I.C.M.R., 1975; Baker, 1978) as criterion for diagnosing ensemia.

It appears, therefore, that workers using vary low haemoglobin values for cut off point of anaemia have under-estimated the extent of problem in their studies. No doubt, in the absence of a universal criterion, it becomes difficult to compare the prevalence of anaemia between countries as well as in different areas of the

same country. W.H.O. (1968) recommended that in pregnant women, anaemia should be considered at a haemoglobin level below 11 gm. percent since 95 percent of normal individuals will fall above this level. This should be considered appropriate criterion for all geographical areas except as modified by residence at higher attitude (W.H.O., 1968).

(iv) Classification of Anaemia of Frequency.

Various attempts have been made to classify anaemia of pregnancy from time to time. Wintrobe (1934) broughtforth following categories, based on morphology of red cells.

- (a) Macrocytic normochromic anaemia,
- (b) Macrocytic hypochromic anaemia,
- (c) Normocytic normochromic anaemia,
- (d) Normocytic hypechromic anaemia,
- (e) Microcytic hypochromic anaemia.

classified anaemia in similar fashion on the basis of size and haemoglobinisation of red blood cells. Trowell (1942) even introduced a new term 'dimorphic anaemia' for macrocytic hypochromic anaemia. As it was found to be caused by dual deficiency of iron and folic acid, the term 'mixed anaemia' or 'double deficiency anaemia' have also been used at various places for describing such type of anaemia.

Vaughan (1936) classified anaemia according to actiological basis as

- (a) Dyshaemopoeitic anaemia,
- (b) Haemorrhagic anaemia,
- (c) Haemolytic anaemia,
- (d) Miscellaneous anaemia.

Morphological classification, based on the examination of peripheral blood films, has been widely used by number of workers in field based studies (Sarna, 1976; Luwang, 1977).

(v) Complications of Anaemia in Pregnancy.

Anaemia in pregnency is one of the major health problems in all the developing countries in view of its high magnitude and widespread ill effects on mother as well as on foetus. A number of studies have shown ill effects of anaemia (Menon, 1967; Chaudhury, 1970; Yusufji, et al. 1973; Sikdar, 1979) in one way or the other.

In Madras, it has been found to be the direct cause of 20 percent of maternal mortality and an associated factor, in another 20 percent (Menon, 1967). Khanam <u>et al</u> (1979) reported that ansemia alone was responsible for 15 percent of the total maternal deaths recorded over a period of 9 years at Govt. Hospital for women, Srinagar. Sikdar (1979) found that ansamia was directly responsible of 8.9 percent of total maternal death. Sikdar and Konar

(1979) and Shargava (1979) have also attributed a considerable proportion of maternal mortality directly to anaemia. According to the conservative estimates of a Study Group on Mutritional Anaemia (Mutritional Society of India, 1968), 85,000 prognant woman die every year from nutritional anaemia in India.

Exblom (1972) and Wranne et al (1973) observed that anaemia causes a reduction in the work capacity and even mild degree of anaemia may result in decreased performance in maximum or near maximum exercise. This may be one of the causes of early exhaustion of anaemic pregnant women during the labour pains. Joynson et al (1972) reported a positive correlation of anaemia and iron deficiency with lowering of resistance and impaired immune response. Johnson and Oso (1962) observed that iron deficiency enaemia reduces the capacity of the epithelium of the skin and mucosa to resist colonisation by organisms.

In severe cases of ensemia, circulatory alterations lead to cardiac failure which may prove fatal (McFee, 1973). Chatterjee (1971) reported that most common fatal maternal consequence of anaemia is the inability of the anaemic to withstand significant hasmorrhage.

A close association has been observed between ensemia and toxaemia of prognancy. Chaudhury (1970) studied 500 consecutive women beyond the 32nd week of pregnancy and observed that 56 percent had hasmoglobin values below 10 gm. percent. Twenty five percent of these anaemic pregnant women subsequently developed toxacmia while in non-anaemic group, only 11 percent suffered from this complication. He further observed that prescribing supplementary iron and vitamins dropped the incidence of toxacmia from 14.6 percent to 4.8 percent.

Anaemia in pregnant women involves a higher risk of ill effects for foetus. Yusufji (1973) observed, in a series of 1,000 pregnant cases from Southern India, a positive correlation between maternal haemoglobin level and foetal birth weight. Baker (1978) reported an increased risk of premature delivery in anaemic pregnant women. He observed that even milder degree of anaemia may be associated with premature delivery, lower birth weight and placental hypertrophy. Hac Gregor (1963) and Rattan and Beishcher (1972) demonstrated a direct relationship between birth weight and haemoglobin levels.

Infants born to anaemic mothers generally suffer a higher perinatal morbidity and mortality than those born to non-anaemic women (Llewellyn-Jones, 1965). Hac Gregor (1963) found both meanatal death rate and still birth rate elevated, each 2-3 times normal, in severely anaemic patients in Kenya.

Mittal and Ketkar (1970) reported that there was 100 percent neonatal loss in mothers with heemoglobin level below 7 gm. percent, 10 percent neonatal loss with a level between 7 - 10 gm. percent and no neonatal or perinatal loss in those with a level over 10 gm. percent.

Studies carried out at National Institute of Nutrition, Hyderabad (I.C.M.A., 1975) revealed that in infants born to anaemic mothers the Iron, folic acid and vitamin B₁₂ stores were very poor and such infants had greater risk of developing anaemia during early infancy.

(vi) Methods used and Types of Studies.

Various methods - direct as well as indirect and assessment of ecological factors have been suggested for the studies on anaemia in the communities (Jelliffe, 1966). The field survey on anaemia may be undertaken by haemoglobin estimation, examination of blood film and, if practicable, haematocrit estimation.

Menon (1964, 1965, 1967), Sood et al (1967, 1968).

Upadhyaya (1971) and Yusufji et al (1973) studied the problem of anaemia under hospital settings; they adopted various sophisticated hasmatological and biochemical assays like hone-marrow examination and estimations of serum levels of iron, folate, vitamin B₁₂ and protein. However, the applicability of these methods in the field situations seems to be impracticable.

Number of methods (Jelliffe, 1966) have been described for the estimation of hasmoglobin levels vis. Talquist method, Sahli's method, Grey Wedge photometer, Spencer hasmoglobinometer and Gyanmeth-hasmoglobin method etc. However, in field situations, only a few of them can be adopted. Sahli's method has been found to be most suitable for field studies (Sarna, 1976; Luwang, 1977).

In recent years, problem of amaemia has been studied by carrying out micro and macro levels investigations in hospital conditions as well as in the fields (solomons et al. 1962; Todd and Kan, 1965; Chopra et al. 1967; Sood, 1967). However, majority of them are hospital based (solomons et al. 1962; Paintin, 1962; Benjamin et al. 1966; Chaudhury, 1939; Shanker, 1962). In fact, community based studies have been very few (Gupta et al. 1973; Sarna, 1976; Luwang, 1977). Nospital based studies have their own limitations and they fail to provide real picture of problem prevailing in the general population. Field studies on anaemia are, thus, significantly important.

NATURE AND MAGNITUDE OF ANAEMIA IN PREGNANT WOMEN

(i) Prevalence of Anaemia.

W.H.O. sponsored studies (W.H.O., 1968) indicated that the prevalence of anaemia in pregnant women, in different parts of the world, ranges from 21 percent to 80 percent; the highest being in India. These studies

further indicate that prevalence rate of ensemia not only differs between countries but also between regions within a country (W.H.O., 1968).

solomons et al (1962) from Maimonides Hospital
of Brooklyn, United States, reported a prevalence rate of
28.7 percent in 1st and 2nd trimester which increased to
50 percent in 3rd trimester. Todd and Kan (1965) observed
that, out of 1,915 pregnant Chinese women, attending Tsan
Yuk Hospital, Hong Kong, 278 had hasmoglobin levels below
10.0 gm. percent. Benjamin et al (1966) reported a
prevalence rate of 71.9 percent in 1,052 antenatal cases
attending Queen's Hospital Centre, New York. Out of this,
49.1 percent were mildly anaemic (hasmoglobin level between
10 and 12 gm. percent) and 22.8 percent had moderate or
severe anaemia (hasmoglobin below 10 gm. percent).

The results of the haemoglobin survey on 555 pregnant wemen of Trinidad, carried out by Chopra et al (1967) showed that 34 percent had haemoglobin values less than 10 gm. per 100 ml. Mean haemoglobin levels were 11.0 and 11.6 gm. percent for those having pregnancy of under six months and over six months respectively. In contrast, mean haemoglobin level for non-pregnant controls was found to be 12.6 gm. per 100 ml.

A study in Warsaw, Poland, revealed that 21.8 percent of the pregnant women had hacmoglobin level less

than 11 gm. percent (W.H.O., 1968). Chopra and Kevany (1971), in their study on pregnant women of eight Latin American nations, found that 46 percent women had haemoglobin level below 11.0 gm. percent.

In India, Chaudhury and Manglik (1938) observed, in 2,400 antenatal women from Agra (U.P.), that only 5.0 percent of them were anaemic (Mb. level below 7.25 gm. percent). Chaudhury (1939) reported a prevalence rate of 8.2 percent (Mb. level below 7.25 cm. percent) in 4,070 antenatal women attending Lady Harding Medical College Hospital, New Delhi. Such low prevalence rates of anaemia, in these two studies, perhaps, could have been due to the consideration of low level, of hasmoglobin as criterion of anaemia. Later studies consistently revealed higher prevalence rates in different parts of the country. Venketachelem (1962) observed that amongst 198 women examined in the third trimester of pregnancy, 56 percent were anaemic. Shanker (1962) in a survey, conducted in 394 prognant women from Miloufer Hospital, Hyderabad, observed an overall prevalence rate of 46 percent (Nb. level below 10 cm. percent).

A study conducted by Indian Council of Medical Research at Lucknow, revealed 28 percent of 2,500 pregnant women to be anaemic (Patwardhan, 1966). Sidhu <u>et el</u> (1967) reported a prevalence of 41.5 percent in 1,271 pregnant women, attending antenatal clinic at the Institute and the

Maternity and Child Health Centres in the surrounding areas of South Delhi.

Sood (1967) compared the prevalence of anaemia in three groups of pregnant women viz. (a) 504 pregnant women from the antenatal clinic of All India Institute of Medical Sciences, Delhi, (b) 497 women from Corporation Maternity and Child Welfare Jentres, New Delhi Corporation, and (c) 106 pregnant women of a rural area of Delhi. It was observed that in these three groups the prevalence of anaemia varied significantly, being 27.3, 43.0 and 47.0 percent in a, b and c groups respectively.

In a hospital based study at Vellore, it was observed that 56 percent of pregnant mothers were anaemic with the criterion of the haemoglobin level less than 11 gm. percent, while only 35 percent of the non-pregnant controls were anaemic (Hb. _ 12 gm. percent). The mean haemoglobin level was significantly lower among the pregnant women (10.2 gm. percent) than that of non-pregnant controls (12.3 gm. percent). In 15 percent of the pregnant women the haemoglobin levels were less than 8.0 gm. percent (w.H.O., 1968).

Gopalan and Raghavan (1969) reported a prevalence rate of 54 percent among 800 pregnent women from different parts of the country. Gajwani <u>et al</u> (1969) observed that, out of 103 pregnant women in third trimester of pregnancy attending antenatal clinics of Nedical College, Baroda, 80 percent were anaemic.

Subramanian and Fernandes (1970), from Women Hospital, Bombay, reported that in their study of 7,420 pregnant women, 67.3 percent were anaemic (Nb. _ 11 gm. percent). Mittal and Ketkar (1970) from Indore, Maut and Panda (1972) from Orissa and Dutta and Dutta (1972) from Gauhati have also shown a high prevalence of anaemia of pregnancy in their hospital based studies.

A study conducted in a rural community of
Ludhiana revealed 30 out of 53 pregnant mothers to have a
haemoglobin level less than 10 gm. percent (Uberoi et al.
1972). Gupta et al (1973) observed, in a rural area near
Kanpur, that 68.8 percent of pregnant women were anaemic.
The analysis further revealed that 25 percent of pregnant
women had haemoglobin level below 8 gm. percent; 20.8
percent had between 10 to 11 gm. percent whereas 8.3
percent had a level of 12 gm. percent and above. The
mean haemoglobin level was 9.2 gm. percent. Luwang and
Gupta (1979) in their study, in a rural area of Varanasi,
found a prevalence rate of 75 percent.

Gajwani et al (1969) opined that variations in the prevalence of anaemia, between countries and within different regions of the same country, are chiefly due to the differences in socio-economic status, customs, nutritional status and cultures of the people. However, in part, it may also be due to the differences in the criteria adopted for labelling anaemia.

(ii) Prevalence According to Type of Anaemia.

Prevalence of various types of ansemia has shown a significant variation from one place to the other (Chaudhury, 1939; Fry, 1961; Sidhu et al. 1967; Chopra et al, 1967). However, the results on prevalence rates are not strictly comparable in view of different criteria used in the assessment of specific type of anaemia and due to the variability in the method of selection of cases as well as in diagnostic techniques adopted. The main techniques used for diagnosing the morphological type of anaemia have either been examination of peripheral blood film or bone-merrow examination or the combination of the two. Kothari and Bhende (1950) recommended that the results of only bone-marrow biopsy may be considered as suitable criteria for the diagnosis of type of anaemia. However, in field situations, it cannot be adopted and so. the exemination of peripheral blood film remains the only method of choice.

Chaudhury (1939) reported that all morphological types of anaemias were equally common. Similar observations were made by Menon and Chandrashekharan (1954), Giles and Burton (1960) and Rami et al (1962).

Fry (1961) observed in a study of 5,000 patients in London that hypochromic ensemia accounted for 92 percent of all types. Sidhu et al (1967) reported, on the basis of

peripheral blood film examination, that 38 percent cases had hypochromia with or without microcytosis. Macrocytic changes were found in 18 percent subjects only. A study conducted by Gajwani et al (1969) revealed that 61 out of 83 cases of anaemia of pregnancy had microcytic hypochromic blood picture. The remaining 22 patients shown the presence of megaloblasts in the bone-marrow. Mowever, out of these 22, 18 had features of an associated iron deficiency also in the form of hypochromia.

chopra et al (1967) reported microcytic
hypochromic anaemia in 77 percent cases, 3 percent showed
a picture of macrocytic anaemia, while dimorphic changes
were found in 20 percent cases. Henon (1967) reported
that out of 325 cases of anaemia of pregnancy 30.5 percent
showed microcytic hypochromic picture while 60 percent
were of macrocytic hypochromic type. In 29 percent cases
bone-marrow showed megaloblastic crythropoiesis.

Subramanian and Fornandes (1970) observed the distribution of anaemic mothers as 93.75 percent in microcytic hypochromic group, 3.12 percent in dimorphic group and 2.34 percent in megaloblastic group. Refractory anaemia was found in 0.79 percent cases. Nair et al (1970) observed that 47.2 percent cases belonged to microcytic hypochromic type, 25.4 percent showed dimorphic picture while 7 percent had megaloblastic anaemia.

Luwang (1977) reported 60.29 percent cases of anaemia of pregnancy belonging to normocytic nermochromic group, 33.08 percent were found to have only iron deficiency changes while 6.62 percent were of dimorphic type.

workers in the incidence of megaloblastic anaemia of pregnancy. Todd and Kan (1965) could not encounter even a single case of megaloblastic anaemia in Chinese anaemic patients. Tasker et al (1956) from Malaya; and Hoo (1962) from Indonesia reported the incidence of megaloblastic anaemia, among anaemic pregnant women, to be 27.7 and 37.3 percent respectively. Fullerton and Watson-Williams (1962) from Abadan, reported 28 percent of all anaemic mothers to have megaloblastic anaemia. Mackenzie and Abbot (1960), and Hibbard (1962) observed a high incidence of megaloblastic anaemia in United Kingdom.

Kothari and Bhende (1952) observed that 40 out of 45 pregnant women from Bombay, were suffering from megaloblastic anaemia. Karthigaini et al (1964) observed an incidence of 54 percent among 50 women in the third trimester of pregnancy. A study conducted by Mehrotra et al (1965) revealed an incidence rate of 52 percent in a series of 100 cases of anaemia in pregnancy. In another study, from South India, Yusufji et al (1973) observed an incidence rate of 60 percent amongst 1,000 women belonging to 3rd trimester of pregnancy.

Adair et al (1936) observed that 88 percent of women had anaemia without any change in peripheral blood picture. This was explained on the basis of haemodilution which occur during pregnancy. However, Sood (1967) opined that in early iron deficiency, microcytosis and hypochromia are not pronounced and so, an apparently normal blood picture may be present in such cases.

(111) Signs and Symptoms of Anaemia.

clinical examination is one of the simple and efficient method for assessing the nutritional status of a community (Jelliffe, 1966). Chopra et al (1967) found 86.1 percent subjects to have symptoms and signs of anaemia. Sasy fatiguability, weakness and dissiness were reported by 50 percent of the examined ladies. Breathlessness was complained by 21.5 percent while fourteen patients were found to have no complaint at all. Around 36.5 percent had pallor of the skin and succus membrane. Slight papillary hypertrophy of the tongue, bleeding gums, and enlarged thyroid was observed in 22.2, 17.2 and 10.7 percent of cases respectively.

Yusufji (1973) observed, in his study, that
majority of pregnant women were normal on physical
examination. Among those who had signs of ensemia,
glossitis was found in 19 percent and stometitis in seven
percent cases. Koilonychia was found in 8 percent of cases.
Pitting cedema on ankle was present in 11 percent of the
subjects. While 3 percent had general ensearce. Eight

percent of the cases were considered to be suffering from towarmia of pregnancy. Vijayalakshmi et al (1975) reported that 4 out of 40 expectant mothers had glossitis while 3 showed angular stomatitis as well.

Shanker (1962) observed that 200 out of 395 pregnant women complained of long standing general weakness, fatiguability and vague bodyaches at the time of examination. The nutritional significance of these findings could not be assessed. Mearly one third of these women showed frank clinical signs of Vit. B complex deficiency affecting orolingual mucous membrane. Dutta and Sarkar (1970) observed that in a gradual onset of anaemia, some of the patients get so well adjusted to lower haemoglobin that they may not have any complaint inspite of a very low haemoglobin level. Mehta (1976) was of the opinion that symptoms like easy fatiguability, tiredness, weakness, headache, bodyache, inability to concentrate and giddiness etc. were non-specific and had no relation to haemoglobin level.

PACTORS INFLUENCING ANAEMIA IN PREGNANCY

(1) Age of the Mother.

A number of attempts have been made, from time to time, to see the association of age of the mother with the prevalence of anaemia of pregnancy (Ganguli, 1954; Leon and Blazer, 1965; Mehta et al. 1971; and Raut and Panda, 1972). Most of these studies indicate that the prevalence of anaemia increase with the advancement of age (Mitra, 1937; Chaudhury and Manglik, 1938; Chaudhury. 1939; Miller, 1959).

Ganguli (1954) reported an increase in the prevalence rate of anaemia with the advancement of age. The mean haemoglobin level was also low in higher age group, being 69.8 percent in above 20 years and 72.2 percent in below 20 years age group. Miller et al (1959) also observed that the age and haemoglobin levels were related to a definite tendency towards anaemia in the older age group.

Mitra (1937), Chaudhury and Hanglik (1938) and Chaudhury (1939) observed that anaemia was less common in younger age group. Leon and Blazer (1965) reported a higher percentage of anaemia in women upto 34 years of age in comparison to those above 34. Giles and Burton (1960), Das at al (1967 b) and Raut and Panda (1972) noted highest incidence of anaemia in the age-group of 20-29 years whereas Mehta at al (1971) reported that anaemia was more common in the age group 25-30 years.

On the other hand, Das Supta and Chatterjee (1953), Shanker (1962), Medalie (1965), Chopra <u>et al</u> (1967) and Chatterjee (1967) could not find any significant relationship between age and anaemia in prognancy.

(ii) Period of Gestation.

A number of observations have been made on the relationship of anaemia of pregnancy with the period of gestation. Nost of the observers are in general agreement (Shanker, 1962; Solomons, 1962; Mehrotra, 1965; Chopra et al., 1967) that the prevalence of anaemia increases and the mean haemoglobin level decreases with the advancement of pregnancy.

Shanker (1962) observed a gradual fall of mean haemoglobin level, with the advancement of pregnancy, being 11.4 gm. percent in first trimester, 10.3 gm. percent in the second trimester and 9.9 gm. percent in the third trimester. Paintin (1962) reported the mean haemoglobin levels to be 12.6 gm. percent in 11.9 weeks, 11.7 gm. percent in 20.5 weeks, 11.0 gm. percent in 28.9 weeks and 10.9 gm. percent in 36.8 weeks of pregnancy. Solomons etal (1962) also reported a fall in haemoglobin levels in the last trimester of pregnancy.

proportion of anaemia between 29th and 36th weeks of gestation. Mehrotra (1965) in 100 normal pregnant cases found a distinct fall of haemoglobin values with the advancement of pregnancy; the mean values being 12.1 gm. percent in the 1st, 11.98 gm. percent in 2nd and 11.76 gm. percent in the 3rd trimester. Perhaps, increased nutritional requirement of foctus and rapid storage of

iron in foetal liver, in the later part of pregnancy were responsible for the fall.

chopra at al (1967) observed a progressive fall in mean hasmoglobin values with the advancement of pregnancy. Women with under 6 month of gestation had a mean hasmoglobin level of 11 gm. per 100 ml. where as in those having a pregnancy of over 6 months it was 10.6 gm. percent. Chatterjee (1967) observed maximum incidence of anaemia during 3rd trimester of pregnancy. Tyengar and Apte (1970) reported that out of 89 subjects, who were non-anaemic during their first trimester of pregnancy.

Surveys carried out in different parts of India (I.C.M.R., 1975) indicated that while only 15-20 percent of women were anaemic at the onset of pregnancy, the incidence of anaemia increased to 60-70 percent in the last trimester. Jolliffe (1978) also reported that majority of women maintained their haemoglobin, within non-anaemic range, upto second trimester but in third trimester a rapid fall occurred.

Medalie (1965), however, reported that there was no significant difference between the distribution of haemoglobin levels in different trimesters. Sarna (1976) also reported no significant difference in the mean haemoglobin levels between 2nd and 3rd trimesters.

she explained that it was probably due to the extensive antenatal care which the mothers received during the 3rd trimester.

(iii) Parity.

A close association has been observed by a number of workers between the parity and the haemoglobin levels (Todd and Kan, 1965; Mehrotra et al. 1965; Yusufji et al. 1973; I.C.M.A., 1974). Most of them suggest that due to depletion of haemopoietic substances in each pregnancy, the prevalence of anaemia is higher in multigravidae.

more common among multigravides than in primigravides.

Ganguli (1954) reported that the average haemoglobin

level was 71.5 percent in primigravides as against 69.1

percent in multigravides. Leon and Blazer (1965) also

reported that the prevalence of ansemia increased with

the increase in parity being 14.7 percent in lesser

parity (upto 6) and 29.7 percent in grand multipara

(7 and above). Mehrotra et al (1965) found that incidence

of macrocytic ansemia was significantly related with the

parity.

Yusufji et al (1973) observed that the mean haemoglobin concentration was significantly lower in woman who had had been more pregnancies in comparison to those who had less than it. A study conducted by I.C.M.R. (1974) revealed

that prevelence of anaemia was significantly lower in women with less than 4 parity than those with parity 4 and above, for the similar age of gestation.

Preponderance of ensemia amongst primigravidae has been reported by Mitra (1937), Chaudhury (1939) and Giles and Shuttleworth (1958). However, these studies were hospital based and the higher incidence was probably due to greater incidence of confinement of primigravidae in the hospitals.

(iv) Lactation.

Very few workers have studied the effect of prolonged lactation as a causative factor in anaemia during pregnancy. Todd and Kan (1965) reported that prolonged and repeated lactation was one of the important factors playing a role in the causation of anaemia. They observed that out of 278 anaemic pregnant patients, 94 were found to have a history of breast feeding of one or more infants for prolonged periods (in excess of one year).

I.C.M.R. (1975) also reported that besides the increased demands during pregnancy, demands during lactation contribute to reduce iron stores and worsen the deficiency state. Since many women have repeated, closely spaced pregnancies with prolonged periods of lactation, there is progressive depletion of iron stores with increasing number of pregnancies.

(v) Socio-economic factors.

Steingold (1966) was of the opinion that poverty is the most important social factor in the causation of anaemia. Kothari and Bhende (1949) observed that in lower socio-economic group, prevalence of anaemia was higher. Das Gupta and Chatterjee (1953) as well as Raut and Fanda (1972) were also of the same opinion. Dawn (1973) observed a higher family income in non-anaemic group in comparison to anaemic group. Vijalakshmi et al (1975) observed in a study in Coimbatore that 75 percent of anaemic pregnant females belonged to the lower socio-economic group. The study revealed that the mean haemoglobin level was also low (9.2 cm. percent) in lower socio-economic group in comparison to that in higher socio-economic group (10.2 gm. percent). Sarna (1976) also observed a positive correlation between monthly per capita income and haemoglobin levels. Chaudhury (1939) reported that majority of anaemic pregnant women in his series, were from lower middle class.

The relationship of anaemia of pregnancy with other socio-economic factors like educational status of pregnant women and their husbands, caste, occupation etc. have been studied by very few workers and literature on it is very meagre. Chopra et al (1967) observed in Trinidad, that the race of the pregnant lady had little or no influence on the incidence of anaemia, Medalic (1965) also could not demonstrate any significant relationship between hemoglobin values and education.

- (vi) <u>Metary Pectors</u>.
- (a) Dietary Habits Upadhyaya (1944) observed that there was no case of anaemia in the non-vegetarian group, which used meat, fish or eggs in addition to vegetable diet.

 Das et al (1967 b) reported that in a series of 181 anaemic pregnant women, 83 percent were found to be pure vegetarian.

 Dawn (1973) observed a significant association between prenatal dietary habits and various grades of anaemia.

 However, Todd and Kan (1965) could not find any significant difference between diets of anaemic and non-anaemic pregnant ladies in Hong Kong. Gopalan et al (1969) also reported that diet of pregnant women was not much different from the usual diet of the non-pregnant women.

Vijayalakshmi et al (1975) observed that none of the 40 expectant mothers included any special foods in their diets during pregnancy. On the other hand, 25 percent were particular to avoid certain foods like pumpkin ashgourd, jackfruit etc. due to various erroneous believes.

A study of dietary intake in Gauri village of Lucknow (Singh et al. 1971) revealed that the majority of the population was vegetarian and even those who were non-vegetarian, consumed hardly any flesh food.

(b) <u>Calorie Intake</u> - Passichs (1958) observed that, in Cooncor, mean intake of calories by the pregnant women was approximately 1,900 calories. However, there were only

3 percent women belonging to 1st trimester when the food consumption is said to be low. Bagchi and Bose (1962) reported a positive correlation between socio-aconomic status and calorie intake, in pregnant women of Calcutta.

Shanker (1962) observed, in his study of low income women of Hyderabad, the average calorie consumption as 1,390, 1,520 and 1,650 per day during 1st, 2nd and 3rd trimester respectively. Chopra et al (1967) found the daily mean calorie intake for pregnant and non-pregnant women to be 1,698 and 1,713 respectively. The study conducted by Vijayalakshmi et al (1975) revealed mean calorie intake of 1,716 per day in higher socio-economic group as compared to 1,503 only in lower socio-economic group.

(c) <u>Protein Intake</u> - Protein intake, as reported by different workers, varies a lot depending upon the regional variation, population characteristics, socio-economic status and religion.

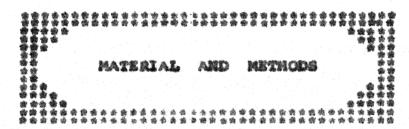
Shanker (1962) observed a mean daily intake of
40 gms of protein in pregnant women. Chopra et al (1967)
reported a mean intake of 59.1 and 56.1 gm. in non-pregnant
and pregnant women respectively. Gopalan (1969) found a
mean intake of only 37 gm protein in pregnant women of
Hyderabad. Singh et al (1971) in their study in a rural
population of Lucknow, observed a mean daily intake of

71.8 gm. protein. Vijayalakshmi et al (1975) reported a mean intake of 36 gm. in lower socio-economic group while in higher socio-economic group it was 47 gm.

(d) Iron Intake - The average daily intake of elemental iron per person had been estimated to vary from 12 to 40 mg. in India (Foy and Kondi, 1957). Shanker (1962) observed that the dietary iron intake in pregnant women was satisfactory. Gopalan (1967) also reported that the average Indian diet seemingly contains adequate amount of iron. Singh et al (1971) found, an average, intake of 22.3 mg. of iron in rural population of Lucknow. Sood (1967) reported that the estimated dietary iron ranged from 30-50 mg. per day. Banerjee et al (1968) and I.C.M.R. (1975) have accepted a relatively higher iron content in average Indian diet. However, the high phytate and low calcium and ascorbic acid content in Indian diet have been shown to restrict the availability of iron and also inhibit its absorption (Apte and Venkatachalam, 1962, 1964 and 1965).

Few workers, however, have reported a lesser intake of dietary iron. Shanker (1962) observed a mean daily dietary intake of 16.8 mg. iron in pregnant woman. Henon (1964) reported a still lower intake (9 mg.) in his series of cases.

(e) <u>Dietary intake of folic acid and Vit. B_{12} </u> - Very scanty literature is available on the dietary intake of folic acid and vitamin B_{12} , the reports correlating the intake of these nutrients and anaemia are also not available. Mehta (1971) reported that out of 143 anaemic cases, 67 percent had inadequate foliate in their diet. Sarna (1976) observed that the mean daily folic acid intake of pregnant women was only 54.1 mg. per day.



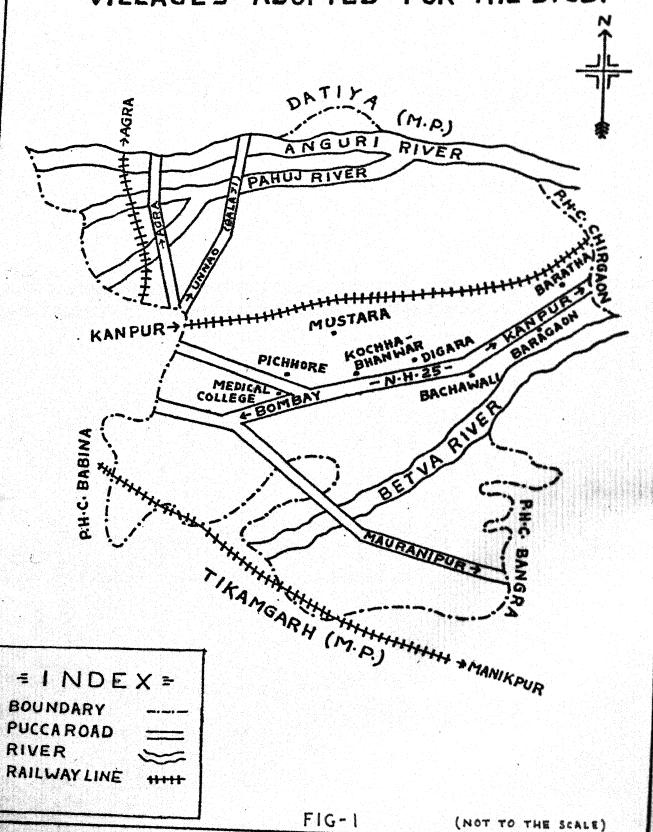
MATERIAL AND METHODS

namely - <u>Mustara</u>, <u>Pichhora</u>, <u>Kochhabhanwar</u>, <u>Digara</u>, <u>Bachawali</u>, <u>Baragaon</u> and <u>Baratha</u>, located within the area of Primary Health Centre, Kochhabhanwar, one of the Rural Health Training Centres of the Department of Social and Preventive Medicine, M.L.B. Medical College, Jhansi, Uttar Pradesh. In this area, no study had been so far undertaken on the problem of anaemia. It is hoped that the present study would, <u>inter alia</u>, provide some important data that may help in the planning of control measures against anaemia in the area.

TOPOGRAPHY AND CLIMATE

District Jhansi of Bundelkhand region is situated in the south-west of the state, surrounded by districts - Owalior, Datiya, Shivpuri and Tikamgarh of Madhya Pradesh and Lalitpur, Hamirpur and Jalaun of Uttar Pradesh. In 1971, district Jhansi had a population of 870,138 (Census of India, 1971). Primary Health Centre, <u>Eochhabhanwar</u> covers a population of 92,023. The total population of the 7 villages considered for the study, as per Primary Health Centre records, is shown in Table 1.

MAP OF P.H.C. KOCHHABHANWAR SHOWING VILLAGES ADOPTED FOR THE STUDY



Yillage-wise distribution of population in the study

area.

S.No.	Name of the village	Population
1	Nustara	440
2.	Pichhore	648
3.	Kochhabhanvaz	4,660
4.	Digara	1,243
5	Bachawali	320
6.	Baragaon	5,132
7.	Baratha	1,500
Total		13,959

All the villages, except <u>Pichhore</u> and <u>Mustara</u>, are situated on Bombay-Kanpur national highway No. 25 and fall within a range of 15 km. from Medical College Campus. Village <u>Pichhore</u> is situated just behind the Medical College, while <u>Eustara</u> is situated in the interior (Fig. 1).

Climate of the urea is hot and dry. Mean monthly temperature, during the year 1978-79 (Govt. of Uttar Pradesh, 1979) ranged from a minimum of 2.3°C to a maximum of 46.1°C. Total rainfall during the year 1978 was 1,227 m

SELECTION OF STUDY AND CONTROL SAMPLES.

All the prognant women of the study area were included in the study group except those who were having a history of :

- (1) gross menorrhagia or epimenorrhoea during the period immediately before conception.
- (ii) diseases like tuberculosis, chronic malaria, urinary tract infection of long duration, mymoedema and malignancy.
- (111) taking treatment in the form of iron, folic acid and/or vitamins (as far as could be ascertained). The concerned A.N.M./F.W.W. of the area was instructed beforehand to issue iron and folic acid tablets to the pregnant women only after the completion of a visit in the third trimester.

An equal number of non-pregnant women belonging to same socio-economic status, parity and age from the same or neighbouring families, were selected to serve as controls. Precautions taken for the selection of controls were same as that for study group.

A total of 246 pregnant women belonging to different trimesters of prognancy were included in the study group. An exactly equal number served as control. Table 2 shows the village-wise distribution of study and control cases.

Yillage-wise distribution of women in study and control groups.

S.No.	Name of the village	STUDY	WOREN	CONTROL	WORKE
		No.	*	No.	*
1.	Kochhabhanwar	67	27.24	74	30,00
2.	Digara	23	9.36	30	0.13
3.	Sarageon	82	33.33	69	28.05
4.	Bachawali	13	5.20	12	4.88
3.	Baratha	39	15.85	46	18.70
3.	Mustara	13	5.29	15	6.10
	Pichhore	9	3.66	30	4.06
lotal	etin viine talainen kirriste kantikke talainen talainen on määrväänin jouluksen on katikein ministe viinka sakau	246	100.00	246	100.00

Majority of women in both the groups were in the age-group of 20-35 years and belonging to poor socio-economic status. Almost all of them were Hindu and Muslims were very few (3 percent in study group and 2 percent in control group). No women belonging to other religion would be encountered. A great majority of women in both the groups were either illiterate or just literate. Family occupation in most of the cases was agriculture or labour. Almost half of the total

pregnant women were found to have a pregnancy of 6 month or above at the time of initial registration. Vegetarians outnumbered non-vegetarians in both the groups.

METHODS OF SURVEY

An extensive search was made, with the help of the A.M.M./F.W.W./H.A. of the concerned villages to detect the pregnant women in the area. Each woman, considered for the study, was subjected to a detailed examination under the following heads:

- (i) General interrogation
- (11) Mistory taking
- (iii) General and systemic examination
 - (iv) Investigations
 - (v) Diet survey
 - (vi) Follow-up of pregnant women.

Various relevant informations were recorded on a pre-tested schedule specially designed for the purpose (appendix I).

(i) General Interrogetion

Ceneral informations such as - name, age, religion, caste, name of the husband and of the head of the family, occupation and socio-economic status etc. were recorded for the respondents of study as well as control groups.

The information on age was verified by obtaining data of

past vital events like age at marriage and first child birth etc. The actual family occupation and the occupation of woman was also recorded. Social classification of families was done as recommended by Frasad (1970).

(ii) History Taking

Detailed histories on menstrual pattern, previous as well as present pregnancy and lactation etc. were obtained as under :

- (a) Menstruel History: This included age at menarchy, cycle of menstruetion, rhythm, flow, presence or absence of clots in menstruel blood and date of last menstruel period. In illiterate women, date of last menstruel period was calculated by relating the first day of last menses with the date of Indian Calender (tithi) or with fairs and festivals of that particular month. In cases with advanced pregnancy where the women did not give any idea about the date, the month of last menses was taken into account.
- (b) Obstetrical History :- Enquiries on number of gravida, parity, abortions and medical termination of pregnancies were also made. The date of last child birth was recorded. Fow details on the previous births, if any, like antenatal care, place and mode of delivery, sex of the child in cases of live births and age of the child were also obtained. The duration of breast feeding for their last child and the time of discontinuation was recorded.

(c) <u>History of Present Pregnancy</u> :- Duration of pregnancy was calculated from the date of last menstrual period and was recorded in months. It was confirmed by the findings of examination of fundal height. Associated complaints, such as - loss of appetite, nausea, vomiting, weakness, giddiness, fever etc. were also recorded.

(111) Examination

concral and systemic examinations were conducted to detect the signs of anaemia like pallor of skin, mucous membrane, conjunctive and nails, keilonychia etc. Their heights and weights were also recorded following standard methods (Weiner and Lourie, 1969). Blood pressure was recorded by a mercury sphygmomanometer in sitting posture, applying auscultatory method (American Heart Association, 1951). The systolic blood pressure was recorded at the first appearance, while diastolic blood pressure was recorded at the muffling of the Korotkoff sounds. Two readings were made at an interval of 3-5 minutes (srivestave et al 1979) and the lover value out of the two was recorded (Rose and Blackburn, 1968).

(iv) <u>Investigations</u>

Homoglobin estimation & examination of general blood picture were carried out in the manner given below.

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(iv) <u>Investigations</u>

Hemoglobin estimation & examination of general blood picture were carried out in the manner given below.

- (a) Haemoglobin Estimation :- Heemoglobin estimation was carried out at the spot by standard Sahli's method (Hunter and Bumford, 1968). The graduated haemoglobinometer tube was filled, roughly upto the mark of 10 percent, with N/10 Ncl. The pipette was filled upto the mark of 20 c.m.m. with blood, obtained from finger prick using aseptic technique, and blown gently into the tube. The pipette was rinsed several times with the acid solution in the tube. The latter was allowed to stand for five minutes. Distilled water was then added drop by drop with the help of a dropper. After addition of each drop, the fluid in the tube was stirred with a small glass rod. It was continued until the tint in the tube matched with the standard. Comparisons were made in day light. Reading was taken one minute after the last drop of water had been added. It was repeated after the addition of another drop of water and if necessary more drops, until the point is reached when the tints are again just unequal and average of the two readings was accepted as the final result. Assults were expressed in om. per 100 ml.
- (b) Examination of General Blood Picture :- For examining general blood picture, thin blood films were prepared at the spot and were stained with Leishman's stain in the laboratory of the Department of Social and Preventive Medicine. The preparation and staining of blood films was done by the following methods:

Preparation of blood film: - One end of a clean grease free glass slide was applied to the drop of blood and the slide was placed on a level surface, holding it with the thumb and index finger of the left hand. The narrow edge of a second slide was placed in the drop and held there till the blood had spread across it; it was then drawn slowly over the whole length of the first slide. The blood film was dried by being waved rapidly in the air.

Staining of the slide :- The slide was covered with the Leishman's stain, evenly distributed over the entire surface. At the end of one minute double the quantity of distilled water was added and mixed with the stain. After 7 minutes, the mixture was poured off and the film was covered with distilled water for two minutes. The water was then washed off with fresh distilled water and the film was dried (Hunter and Bomford, 1968).

The dry blood film was examined under the oil emersion to see for the size, shape and haemoglobinization of the red blood cells.

(v) blot Survey

Diet survey was conducted in both study as well as in control groups by interview method, using recall period of 24 hours as recommended by Indian Council of Medical Research (1951). Proforms on diet survey was designed following the points indicated by National

Institute of Mutrition, Hyderabad for such surveys (appendix II).

Informations on the family composition, their distary habits and intake of food articles, in last 24 hours, by the family as well as by the respondent were recorded. Nutrient intakes were worked-out in terms of energy, protein, calcium, iron, vitamins and folic acid with the help of the tables, designed by Indian Council of Medical Research (Gopalan at al. 1971) for the purpose.

(vi) Follow-up of Pregnant Women

Pollow-up examination, of the study women who had been registered in first and second trimesters of their pregnancy, was carried-out during second and third trimesters respectively at an average interval of about 3 months. Here too, general and systemic examinations were conducted to detect their deviations, if any, from their previous findings. Hemoglobin estimation and general blood picture examination were also repeated following the procedures, indicated earlier.

CRITERIA FOR DIAGNOSIS OF AMAERIA.

All the pregnant women with a heemoglobin level below 11.0 gm. percent and non-pregnant women with a

heemoglobin level below 12.0 gm. percent were taken as anaemic (W.H.O., 1968). The type of anaemia was decided on the basis of red cell morphology in general blood picture as recommended by Wintrobe (1934).

OBSRVATIONS



CASERVATI CHE

The present study was carried in 7 villages, located within the area of Primary Health Centre Kochhabhanwar (Fig. 1), a Rural Health Training Centre of the Department of Social and Preventive Medicine, M.L.B. Medical College, Jhansi, Uttar Pradesh. Total population of these villages, as per Primary Health Centre records, was 13,959 (Table 1; please see, page 38).

A total of 246 pregnant women belonging to the different trimesters of pregmancy, were studied. An equal number of non-prognant women from the same villages served as central (Table 2 , please see, page 40). At the time of initial registration, 27 (11.0 percent) women were belonging to the first trimester, 82 (33.3 percent) to the second trimester and 137 (55.7 percent) to third trimester of pregnancy. Women registered in first and second trimesters were also followed up in their next trimester, after an average interval of 3 months, to study the changes in heemoglobin levels vis-a-vis to the gestational age, if any, and incidence rate of anaemia of pregnancy. Women who were registered in their first trimester of pregnancy had an ample scope for two successive follow-ups during their second and third trimesters; they too could be followed up only once in view of paucity of time.

A SECTION OF THE PARTY OF THE P

In the controlled studies like present one, the two samples - study and control, should be homogeneous in respect of different socio-economic and demographic characteristics, as far as possible. With this in view, the selection of non-pregnant women was done in such a way so as to make study and control groups comparable in respect of age, parity and socio-economic status. Incidently, the analysis indicated, that the two groups were similar in respect of many other factors, namely - caste, literacy status of the couple, age at consummation, age at first child birth and duration of menstrual phase. The study and control groups were thus homogeneous (P \(\subseteq 0.005 \)) in respect of many socio-economic and demographic characteristics.

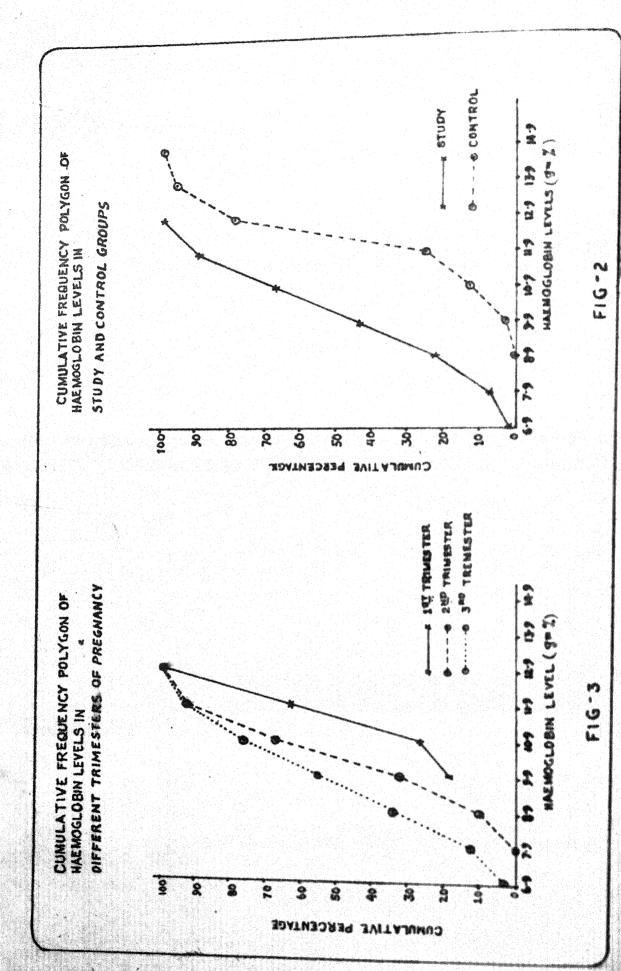
EXTENT OF THE PROBLEM OF ANABATA OF PREGNANCY IN THE AREA.

Out of 246 women studied in each group - study and control, 166 and 61 women were found to be anaemic respectively. The overall prevalence rates were about 68 percent in study and about 25 percent in control groups (Table 3); the difference being statistically highly significant ($x^2 = 65.44$, d.f. = 1, $P \subseteq 0.001$). Prevalence of anaemia increased significantly with increase in duration of pregnancy, highest being in the third trimester of pregnancy ($x^2 = 25.62$, d.f. = 2, $P \subseteq 0.001$). Prevalence rate of anaemia, based on observations in initial and follow-up survey was found to be about 69 percent.

Prevalence of appends in different groups.

	No. studied	×	Ansende	×	Prevalence rate (%)
Arge Crimoster		•		4.2	25.0
	8	200	***	33.1	1.69
Pird tributer	8	S			75.9
Total pregnant vomen	246	10000	32	100.0	67.5
Notal observations*	323	7		3	***
control group	266	1	3	3	24.0

* includes initial and follow-up observations.



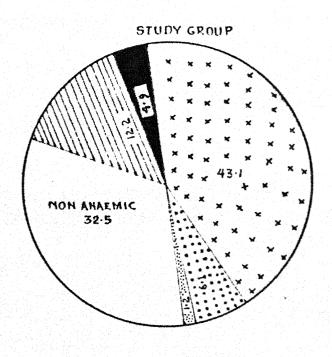
groups and in different trimester of pregnancy has been illustrated in Fig. 2 and 3 respectively. Hasmoglobin levels in study group were significantly higher than those of controls. These levels decreased as duration of pregnancy enhanced. Such differences were found to be statistically highly significant (Table 4).

Prevalence of different morphological types of anaemia has been shown in Fig. 4. Microcytic hypochromic anaemia showed highest prevalence rate in both the groups. Macrocytic anaemia was completely absent in the control group. Distribution of various morphological types of anaemia by severity was also studied. Prevalence of normocytic anaemia decreased with increase in the severity of anaemia whereas macrocytic type was observed in moderate and severely anaemic cases only (Table 5).

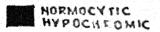
In studies on morbidity, incidence rate is a more sensitive index than that of prevalence as it indicates a fresh transmission of the disease or development of the condition. Follow-up investigations of pregnant women who had been registered in first and second trimesters of their pregnancy also enabled us to work out incidence rates.

Out of 20 and 27 non-anaemic women belonging to first and second trimesters respectively at the time of initial survey, only 13 (65.0 percent) and 19 (70.4 percent) could

PREVALENCE OF VARIOUS MARHOLOGICAL TYPES OF ANAEMIA



HORMOCYTIC HORMOCHROMIC



MICROCYTIC HYPOCHROWIC

HYPOCHRONIC

MACROCYTIC NORMOCHROM 2

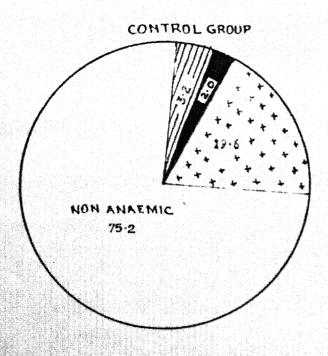


TABLE 4.

ean hasmoglobin levels in different groups.

	ś		Recrossolobin Lovel	Start Frence of
			Mean + S.D.	t-value P-value
STORE STORES				
Arts Calmater	8		11.0 2 1.1	
Second Colmoster	8	:	10.5 ± 1.1	199.0 7
			9.7 ± 1.5	3.67
	1 %	100.0	10.2 ± 1.5	*
	*	0.00	22.3 + 2.5	10.0 7 min

Distribution of morphological types by severity of ansemia.

1891 - A. **I**II N

Morphological trypes of ansemia.				3	4.4							
				Same distrib				0				
			8		Š							
					\$	X	% *	14	ŝ	×	8	×
Normocytic normochromic		3			1	1		8 28.6 H11	1		1	3
Hormocytic hypochronic		? 3		•	7	1		3			3	4
Microcytic	9				2	3	2	5	8	0 0	•	1000
Macrocytic hypochromic				3	•	7		T = T = T	3	=	**	3
Macrocytic		1		e4 e4		3	1	5.3 MI MI	7	nil nil		3
		100.0		99 100.0		100.0	8	100.0	Ħ	19 100.0 28 100.0 31 100.0 2	•	8

* Nor criterion, see appendix III.

be followed up successfully (Table 6) and rest were 'lost to follow up' because of various reasons such as - 'could not be traced because of being dead', 'moved to some other place permanently', 'not available at the time of visit' and 'available but refused to co-operate'. Five women in the first trimester group and 9 in second trimester group transited from non-anaemic state to the anaemic state.

Gross and net incidence rates were worked-out by considering the risk of 'lost to follow up' cases or otherwise respectively. Incidence rates also showed a similar increasing trend with increase in duration of pregnancy. The overall gross and net incidence rates were about 30 percent and 44 percent respectively.

Anaemic women in the two groups - study and control had various symptoms and signs. Their distribution has been shown in Table 7 and 8 respectively. About 46 percent anaemic and 20 percent non-anaemic cases complained of various symptoms in study group; in control group, however, this proportion was 13 percent and 5 percent respectively. Many women complained of more than one symptoms. In anaemic women of study group, positive signs were detected in 81 percent against 67 percent in control group.

references of		HENDER OF CASES	ANABER OF BON		(S.)	
initial regiotration	studiod initially	Pound non-anaenic	Pollored	Purnod ansente	egooge G L OSE	į
		8			25.00	39.46
	.				***************************************	6.6
1	8		3		29.78	43.75

TABLE 7.

Distribution of cases by symptoms.

			SHOW D				Continue GROUP	
	1		8		8	A Section	Š	Non-anaemic
	è		Ş		2		*	
Asymptomatic	8	;	8	8		98	2	50
toss of appetite	N	15.1	•			0.4		000
	2	•					•	***
	•						:	
	\$	**	•			0		
Palpitetion	8	9.50		•		9.0	73	
	2	•						
		•				97		
Others	2			0		7.6	•	*
3	35	166 100.0		1000		100,00	567	1000

* A few cases had more than one symptoms.

TABLE 6.

Distribution of ansemic cases by signs related with anaemia.

		STEEL GROUP	CONTROL GROUP	
			•	*
			20	32.68
	9			67.2
hin and sparse hair		2		
noules etcontitie	8	2	N	**
trophic popilies of tengue		å		
		3		
ongestive heart fallure				***
				**
		0.001		100.0

* A few capes had more than one positive signs.

SOCIO-ECONOMIC FACTORS AND ANARMIA.

About 97 percent women in both the groups were Mindu and rest were Muslims. The two groups - study and control were similar in respect of their religion $(x^2 = 0.29, d.f. = 1, P. 70.05)$. No association of religion with the state of anaemia could be observed (P 70.05).

The distribution of women by caste has been shown in Table 9. Analysis indicated that about 60 percent women in both the groups belonged either to backward or schedule castes. The two groups were similar in this regard ($x^2 = 3.15$, d.f. = 1, P 70.05). No significant association of prevalence of anaemia with caste could be observed in study ($x^2 = 3.54$, d.f. = 1, P 70.05) as well as in control groups ($x^2 = 0.06$, d.f. = 1, P 70.05).

About 81 percent women in study group and 76 percent in control group had no formal school education and were categorised as illiterates (Table 10). Amongst those who had some formal education, 50 percent had not passed even primary and were categorised as just literates. Thus, more than 85 percent women in both the groups were either illiterate or just literate. The difference in the literacy status of women in two groups was statistically insignificant (X² = 3.92, d.f. = 4, P 7 0.1). Prevalence rates of anomals were significantly higher in illiterate women than those who had some formal education in study

· Mava

Prevalence of ansenia by caste.

	etudio.	×	Apsente	*	Prevalence Fate (%)	studied	**		ite %	Anagaic » Provalence cases rate (%)
on schedule aste (excluding ackwards)		8	•	48 28.0	:	8	100 40.7 24 39.3	2	8	2
ackward/ Chedule caste	\$	•		118 71.1	71.5	2	146 59.3 37		3	25.3
		246 100.0	1	166 100.0	\$ 5	286	246 100.0 61 100.0	3	0.00	26.8

* No case belonged to schedule tribe.

TABLE 10.

Prevalence of ansemic by literacy status.

								Ö		3
		.1	Anseer Co.	Sente	Prevalence Fate (%)	20 20 20 20 20 20 20 20 20 20 20 20 20 2	X	Ansemic	* 3 m	Prevalence rate (%)
	8	3	2	0.34	0:2	នឹ	62.3	***	0.00	000
Part License	8	20.3	R	64 60	0.00	4	13.2			
	*		2	9*6	•	2	14.2	•	0	
funior High School	8	:	2	13.3		2	d	•	9	9
		3	1	3		64	0	m	id? •	4
Intermediate and above				•	24.3	3		N	n	
		185.0	188	1000	10.6	246	246 100.0	13	2007	26.8
III terate			187		73.1	3	75.6	*	, s	1 0 0
	2	3	2	77.7		3	7.	•		
	\$ 	246 100.0	133	100.00	6.5	13	246 100.0	3	100.03	24.9

 $(x^2 = 16.12, d.f. = 1, P \angle 0.001)$ as well as in control group $(x^2 = 7.37, d.f. = 1, P \angle 0.01)$.

Literacy status of husband was found to be better than those of women, though, about 60 percent husbands were either illiterate or just literate (Table 10). Literacy status of husbands in the study group was comparable with corresponding controls ($x^2 = 5.13$, d.f. = 5, P = 70.1). The prevalence of anaemia showed a significant fall with the increase in the literacy status of the husband in study group ($x^2 = 19.25$, d.f. = 5, P = 10.005). For control group, however, no such significant association could be observed ($x^2 = 4.22$, d.f. = 3, P = 70.1).

For majority of women in the two groups, agriculture was the main family occupation followed by labour, service and business, in order (Table 11). The two groups - study and control were observed to be significantly different ($x^2 = 10.46$, d.f. = 4, $P \angle 0.05$) in this regard. No significant association could be observed between prevalence of ansemia and main occupation of the family in study ($x^2 = 4.96$, d.f. = 3, P = 70.1) and control groups ($x^2 = 1.83$, d.f. = 3, P = 70.5).

About 80 percent women in the two groups were from social classes IV and V (Table 12). The study and control groups were similar as regards their socio-economic status ($X^2+1.17,\ d.f.+2,\ P=70.5$). The provalence of assessa significantly increased with

TABLE 11.

evalence of anaemia by family occupation

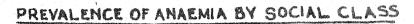
								3	CONTROL GROW	4
ocupation	at B	*		atc es	Prevalence rate (%)	No. studied		Ancomisc	w See	Frevalence Fate (x)
getenlture		; ;	8	9; 3	3	8	7	8	41.0	8
		3	2	33.1	?	3	36.2	র		~ ~
į	8	13.4	7	14.5		\$	\$	2	16.4	8
	9	F		9.	S. S.	*		*		
		3		3	***	٥	*		9:	16.7
	***************************************	246 100.0 166	3	100.0	67.5	3.5	246 100.0	5	61 100.0	

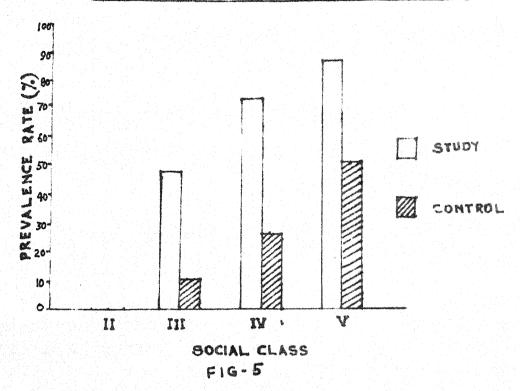
Types 12

Prevalence of ansemia by social class.

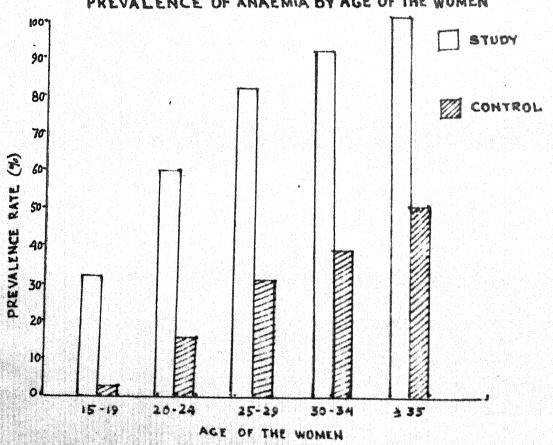
								8		
			Assemble cases	×	Prevalence rate (x)	No. studied	M.	2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	× 3 9	Prevalence Fate (%)
		: :	1	1	:		8	7		:
	3	Ì	8	:	3		2	n	•	0.0
		?	•	ë	:	9	6	3	3	***
		8	2		**	8	3	*	23.0	20.0
1	3	246 100.0	3	100.0	67.5	3%	246 100.0 61 100.0	3	1000	24.8

. No case belonged to Social Class I.









F19 6

decrease in socio-economic status (Fig. 5) and was highest in social class V. The differences were statistically significant in study ($x^2 = 21.15$, d.f. = 1, P \angle 0.001) as well as in control groups ($x^2 = 16.01$, d.f. = 2, P \angle 0.001).

DEMOGRAPHIC PACTORS AND ANAEMIA.

More than 70 percent women, in both the groups were below 30 years of age (Table 13). Ages of women in study and control groups did not differ significantly $(x^2 = 6.54, d.f. = 4, p. 70.05)$. Prevalence of anaemia showed a rising trend with the advancement in age (Fig. 6) in both the groups. Age was found to be significantly associated with anaemia in study $(x^2 = 46.75, d.f. = 2, p. 20.001)$ as well as control groups $(x^2 = 24.16, d.f. = 3, p. 20.001)$.

More than 90 percent women in both the groups were married at an age of 16 years or less (Table 14). A significant difference was observed in the ages at marriage of the women in study and control groups (x² = 21.69, d.f. = 3, P 7 0.001). Prevalence of anaemia was highest in pregnant women who were married at an age of 12 years or below and declined with increase in such age (Fig. 7). These differences in prevalence rates for various ages at marriage were statistically significant (x² = 14.08, d.f. = 3, P \(\infty \) 0.005).

CY TROUGH

Prevalence of ansents by age.

								8	CONTROL CROWN	
î				* 4 2	Prevalence rate (%)	BO. Studios		Append Consend	de %	Prevalence rate (%)
9		3	2	:		8	0.53		9;	*
8 •	8		S	3		*	28.9	2	0	4
8	8	3	3		•	8	26.8	8	0.53	30.3
3 1 2		3	8		*:	8	20.0	2	***	0.23
		3		:	9	2	6		7.97	50.0
	8	346 100,0 266	3	9.83	67.5	1 8	246 100.0	3	61 100.0	%.0

unitary of appenda by any of partitions.

erates general	e i			*	Prevalence Fate (%)	No. studied	×	Appendig 9 9 9 9 9 9 9	38 U	Prevalence rate (%)
	3	8	8	ន់	28.	.	0:11		2,0	
: !		3	8		25	3	63.0	8	5:5	0,00
** !		ŝ	3	ë	3	3	36.	2	33.3	2.5
		3		3	;		•		***	
			3	266 100.0 166 100.0	6.6	38	100.0	246 100.0 61 100.0	100.0	2.5

CONTROL AGE AT PIRST CHILD BIRTH T STUDY PREVALENCE OF ANAEMIA BY AGE AT MARRIAGE, CONSUMMATION AND FIRST CHILD BIRTH AGE AT CONSUMMATION OF MARRIAGE (YEAR) F16-7 1 MIIII AGE AT MARRIAGE (MELER) 13-14 717 1001 05

In control group, however, no significant association could be observed between prevalence of anaemia and age at marriage ($x^2 = 2.26$, d.f. = 2, p 7 0.1).

Unlike age at marriage, ages at consummation were similar in the two groups ($x^2 = 5.87$, d.f. = 3, P $\neq 7$ 0.1). Prevalence of anaemia decreased in both the groups, with increase in age at consummation (Table 15, Fig. 7). The highest prevalence rate was observed in women for whom such age was 13 years or less. The differences were statistically significant in study ($x^2 = 22.31$, d.f. = 2, P $\neq 10.001$) as well as in control groups ($x^2 = 3.65$, d.f. = 2, P $\neq 10.001$).

In about 95 percent women in the two groups, age at first child birth was less than 21 years (Table 16). The two groups were well comparable for their age at first child birth ($x^2 = 5.41$, d.f. = 3. P $\neq 7.0.1$). A declining trend was observed in prevalence of anaemia (Fig. 7) with increase in such age in both the groups. The differences were observed to be statistically significant for study group ($x^2 = 8.46$, d.f. = 1. P $\neq 0.905$) only.

About 50 percent women, in both the groups, had a parity of 3 or less; about 17 percent women were nulliparous (Table 17). Parity also did not differ eignificantly in the two groups ($x^2 = 0.34$, d.f. = 5, p 770.5). The prevalence rates of anomia shound a considerable relationship with the parity of the women in

37 TINE

Prevalence of anseria by age at consummation of merriage.

			ŝ	AND AND				8		
eseries (geo.)	otu 250.		Anseeride		Prevvalence rate (%)	# # # # # # # # # # # # # # # # # # #		Ameento	N O	Prevalence rate (%)
	8	3		8	0.00	3	20.3	**	7	9
	3	3	8	3	9.	246	8		3	9
				3	?;	8	9	ø	0	***
8		:			.		•			· .
	3	246 100.0	-	100.0	67.5	346	346 100.0	12	62 100.0	24.8

TABLE 26.

evalence of ansents by age at first child birth.

									CONTROL GROUP	4
irst old is year)			Assemic		Prevalence rate (%)	Pio.	×	Assesson Ass	48	Prevalence rate (%)
				28.0	0.001		7		8	41.0
		:		46.2		*	30.2	**	30.4	30.0
	8	ន់	8	9	1	2	3	2	8	26.3
			1	1			•	***	9	
	18	9 9		156 100.0	76.9	202	200 100.0		61 100.0	8

TABLE 17.

										3
i			An absent	×	Provalence rate (%)	No.			×	Prevalence rate (%)
•	3	% 5	la	9	25.0		7:4	1	3	
•	8	25.5	3	10.0		8	0.5	o o	2:3	
•	6	: :		?		5	7		16.0	2
•		3		27.2	8	3	20.5	Ħ	18.0	
		:				25	70.7	**	0.0	3
•		•	•	i	10000	\$	7.	2	65.9	9*8
	3	9,03	3	000.00	:	246	1000	3	100.0	

PREVALENCE OF ANAEMIA BY PARITY

STUDY

CONTROL

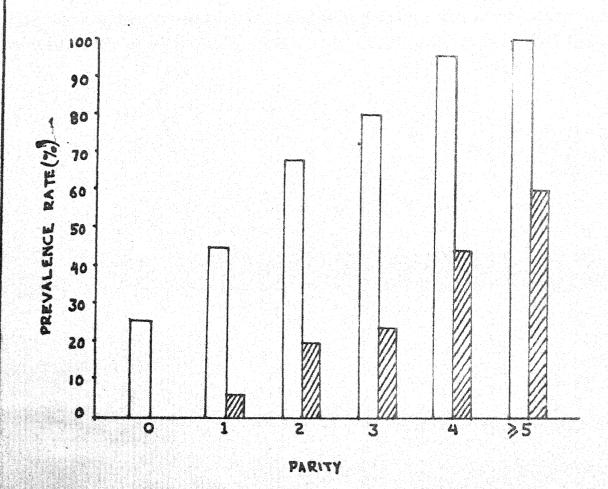


FIG-8

both the groups (Fig. 8). All the pregnant women of para 6 and above were found to be anaemic as against 25 percent of nulliparous. The prevalence rates were significantly associated with parity in study ($x^2 = 73.08$, d.f. = 3, P \angle 0.001) as well as in control groups ($x^2 = 53.20$, d.f. = 3, P \angle 0.001).

In majority of cases, in both the groups, duration of mermitrual phase was of less than 5 days (Table 18). The two groups - study and control, were also similar in respect of duration of menstrual phase $(x^2 = 0.96, d.f. = 1, P.70.1)$. No significant association could be observed between prevalence of anaemia and duration of menstrual phase in study $(x^2 = 1.09, d.f. = 1, P.70.1)$ and central groups $(x^2 = 0.12, d.f. = 1, P.70.5)$.

Prevalence of ansemia decreased with the increase in the space between last child birth and present pregnancy (Table 19). Highest prevalence rate was observed for women with less than 11 month of space between last child birth and present pregnancy. The differences were significant at 1 percent level $(x^2 - 10.07, d.f. - 2, P \angle 0.01)$.

TABLE 10.

Prevalence of ansents by duration of senstrual phase.

Paration 94							3		
Phase (day)	no. studios	Assemble		% Provelence No. % Amenic % rate (%) Studied % cases %	2 3			×	Prevalence rate (%)
•	210 85.4		8	66.2	8	202 62.1 51 83.6		63.6	**************************************
. 1/2	: :		2 6.5	75.0	•	46 17.9 10 16.4	2	79.	S
	246 100.0		66 100.0	5.5	246	246 100.0 61 100.0	3	0.001	

SABLE 19.

macmia by space between last child birth and present pregnancy.

Prevalence Fate (%)	6.00		73.9	9,	26.8
*	10.2	66.2	9,0	12.8	100.0
Absento				8	25
	3		:		100.0
	2				8
Space between last child birth and present prognamcy (nonth)		•	:	; ``.	

PREVALENCE OF ANAEMIA BY DURATION OF BREAST FEEDING TO LAST CHILD

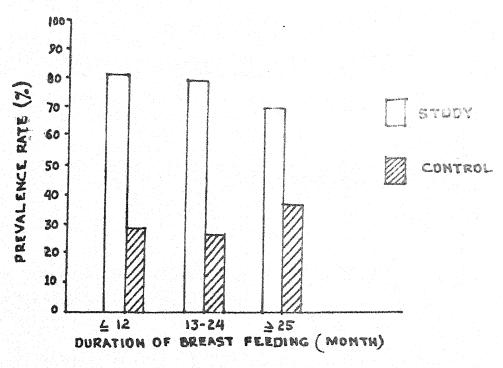
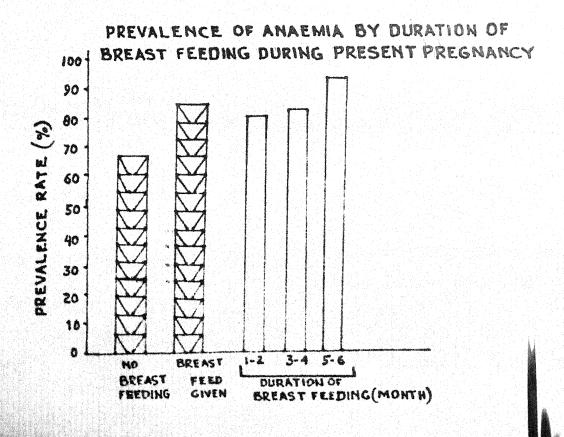


FIG-9



LACTATION AND ANAENTA

In order to investigate the association of lactation with the prevalence of anaemia; prevalence rates of anaemia were worked out in relation to the duration of breast feeding to the last child (Table 20) and during the present pregnancy (Table 21).

In study group, 86 percent and in control group, 76 percent of the women had given prolonged breast feeding to their last child (in excess of one year). Only 31 percent women in former group and 28 percent in the latter had this duration for more than 2 years. The two groups were considerably different in respect of duration of breast feeding to the last child ($x^2 = 6.48$, d.f. = 2, p = 70.05). Prolonged breast feeding to the last child was found to have no significant effect on the prevalence of ensemia (Pig. 9) in study ($x^2 = 2.88$, d.f. = 2, p = 70.1) as well as in control groups ($x^2 = 2.21$, d.f. = 2, p = 70.1).

prevalence rate of anaemia was found to be significantly higher ($x^2 = 9.38$, d.f. = 1, P \angle 0.005) in women the gave breast feed during present prognancy than those the did not (Pig. 10). However, the duration of breast feeding during present prognancy showed no considerable impact on the prevalence of anaemia ($x^2 = 0.45$, d.f. = 1, P $\frac{7}{2}$ 0.1).

TABLE 20.

Prevalence of ambenia by duration of breast feeding to last child.

Manual Section 100. 10 last child 100. (nomen) setudiod									
				Servatence	0		Ansenta	×	Proventence Fate (%)
		00000	1	S este					
	9.2	8	3	3	•			23.0	8
3	:	8	°:		8	9	2	9.7	?
*	ŝ		8	*		9	7	**	8.
	203 100.0	13	156 100.0	76.8	3	100	204 100.0 61 100.0	0.01	8

TABLE 21.

Prevalence of anaemia by duration of breast feeding during present pregnancy.

reset feeding during present prognancy (month)	atudies		Anaemic		prevalence Kate (%)
		:		0.5	80.08
		;	3	32.1	92.0
				16.0	92.6
	2	9.09	103	0.99	
No breast feeding		9.00	8	34.0	66.3
	88	0.001		8	

DIETARY PACTORS AND AMARKIA

Dietary intake is one of the most significant factors, influencing the state of ensemia. With the view to study its impact, if any, on its prevalence, the daily dietary patterns in respect of various food components were investigated for study and control groups, for ansemic and non-ansemic women separately.

pattern in study and control groups has been shown in Table 22. Intake of cereals as well as of roots and tubers was significantly higher in control than in study group. Intake of milk and milk products was observed to be relatively higher in study group. No significant difference was found in intake of other food components. Further analysis (Table 23) revealed that intake of cereals was significantly higher in non-anaemics than anaemics in both the groups. In pregnant group, there was no significant difference in the intake of other food components between anaemics and non-anaemics. In control group, however, intake of green vegetables as well as of roots and tubers was also significantly higher in non-anaemics.

Average K.cal. intake was higher in control
than in study group; the difference being statistically
significant (Table 24). Likewise, daily intake of other

SABLE 22.

Daily dietary pattern (intake) in study and control groups.

	anone Xanas		Significance difference	
	Mean ± 5.D.	Rean ± 6.D.	Saller 3	
	364.2 ± 89.9	399.6 ± 86.5	4.46	7 0.00
	13.9 2 16.6	4	8	7 0.05
Green leafy vegetables	9.4 ± 29.7	10.0 ± 26.5	37.5	7 0.05
	34.5 ± 43.0	49.5 ± 42.3	5.0	7
other vegetables	4.65 + 6.55	52.6 ± 56.1	623	7 0.05
Man and milk products	24.4 ± 59.2	13.9 4 66.1	**	837

79

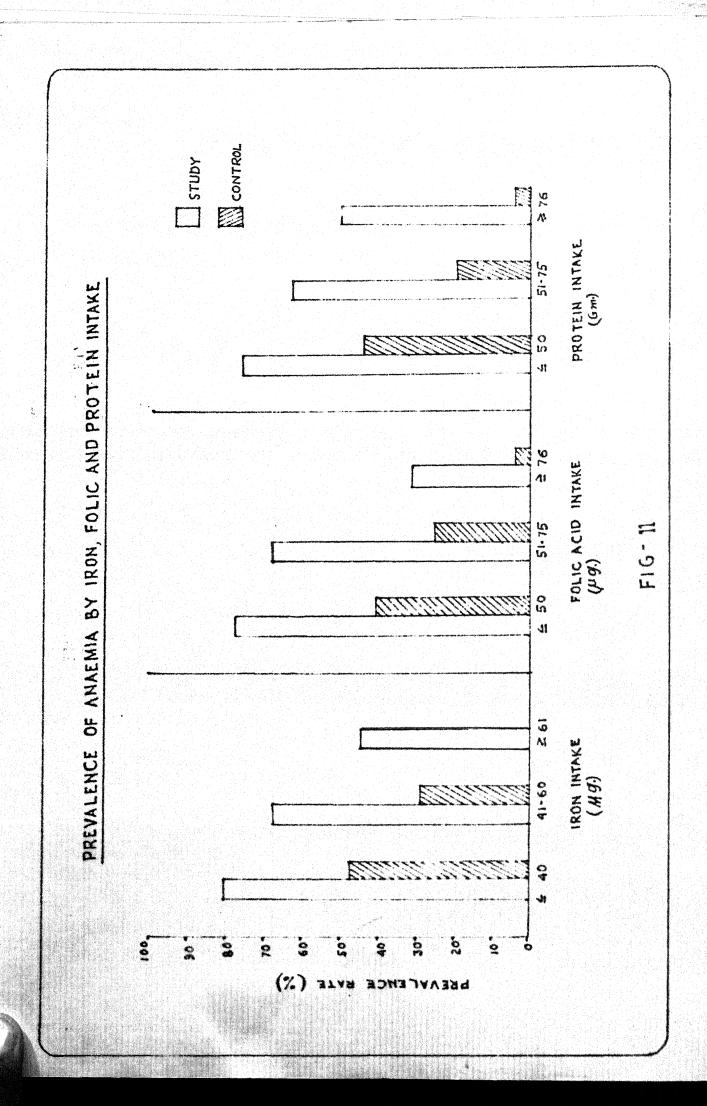
Salara 23.

Dally dietary pattern (intake) in ansemics and non-ansemics in study and control groups.

				Š	CONTROL GROUP	10	of of foreston
				Ansento	Mon-anaemic		
			terelus Persius	1_			
	Meanifo.D.	Meanaga.D. Mean & S.D.					
	346.0+88.0	346.0488.0 401.3182.7	100*0 7 85**	343.4±68.0	419.1+94.1	3	18.07
			0.73 7 0.05		13.6+19.1		7 0.8 8
	9.1427.6		1.01 7 0.05	3.7413.9	12.1229.3	2.5	50.0 7
Vegetables			0.65 7 0.05	50.2442.5	46.3441.9	8	80.07
			1.34 7 0.05	43.448.7	55.7±58.2	1.46	7 9.38
Wegetables 50-2237-4 Walk and 19-4-51-9	19.4.51.9			E . S. S	14.144.8	99.0	7 0.05

Daily inteke of different nutrients in study and control groups.

	STUDY GROUP	CONTROL CAULT	difference	Significance of difference
	News + 5.D.	Mean ± S.D.	t-yalw	t-value P-value
Buerray (K cal.)	1506.1 ± 357.8	1615.9 + 338.5	Š	7 0.001
	54.9 ± 17.2	59.0 ± 15.2		7 0.0
Calcium (mg.)	286.6 ± 205.1	293.5 ± 144.4	0.55	7 0.08
	48.0 ± 15.1	52.5	3.15	7 0.00s
Polic acid (mg.)	57.6 ± 21.5	64.7 ± 21.5	5	7 0.001



also significantly higher in control group. As only negligible women in the two groups had consumed foods containing Vit. B₁₂, and numerous hurdles involved in its accurate measurement, its intake was not worked out. Further, it is quite evident from Table 25 that intake of all the nutrients was significantly lower in anaemics than in non-anaemics in both the groups.

Effect of dietary factors on anaemia was investigated by studying the association of latter with daily intake of iron, folic acid and protein in both - study and control groups. Table 26 (Fig. 11) showed prevalence of anaemia by daily iron intake. It may be seen that prevalence of anaemia decreased with increase in the iron intake, highest rate being for women taking less than 40 mg. of iron per day. This association in study ($x^2 = 14.18$, d.f. = 2, $P \angle 0.001$) as well as in control groups ($x^2 = 11.47$, d.f. = 1, $P \angle 0.001$) was statistically highly significant.

paily intake of folic acid was also found to be significantly related with the prevalence of anaemia in the two groups (Table 27, Fig. 11). It showed a continuous decline, with increasing intake of folic acid in study $(x^2 - 22.26, 4.2. - 2. P \angle 0.001)$ and control groups $(x^2 - 9.41, 4.2. - 1. P \angle 0.005)$.

TABLE 25.

Dally intolm of different nutrients in ensemics and non-ensemics in study and control groups.

		AROND MINA	Significance of difference			CONTROL GROUP	of difference	of difference
		Steel Steel				Non-anaemic		
	Meants.D.	Keen ± 8.D.			Mean+5.D.	Mean & S.D.		
	1433.7±322.4	morgy 1433.7±322.4 1656.3±382.3	3	100.0 7	7 0.001 1438.5±260.8	1674.34341.4	3	100.0 7 96.4
Protesta (m.:)	53.12 16.7	53.12 16.7 59.62 17.7	Ä	80.07	51.44 12.9	61.64 15.1	5	100*0 7
	251.84165.0	251.84165.0 352.54258.0		100.0 7	250.8124.7	307.6±148.0	8	10.07
	Eson (mg.) 45.5± 16.2	53.04 15.9	3	100.0 2	44.44 9.0	54.64 13.6	Š	7 0.00
Polite actd (mg.	Police (mg.) 53.04 19.1	65.51 25.7		100.0 7 10.4	55.2± 14.8	67.94 22.5	8	100.0 7

TABLE 26.

								3	CONTROL CROUP	
13	3 10 3 10 3 10 3 10 3 10 3 10 3 10 3 10			* 4.	Prevalence rate (%)	No. % studied %	a N	Ansemble		Prevalence rate (%)
8	8	; ;	6	3	3		36 14.6		50	47.2
8	\$:	8	i	7.6	3	3		::	88
8	8	3		ំ	•		:	•	4	1
	3	246 100.0 166 100.0	3	100	67.5	246	246 100.0	2	0.001 100.0	*

Typic 23

Prevalence of anaemia by daily folic acid intake.

			ě					CONTRICT	SCHOOL CROSS	
(100.)	Mo.		Assession of the second of the		Prevalence rate (%)	No. studies	×	Ansemic Cases	×	Prevalence rate (%)
8	8	e 8	*		3.6		22.0	8		3
:	3	3		9	3	3	9	5	60.7	25.9
: }	8				31.0		60.01		**	
	*	246 100.0 166	3	80.00	\$ 55	246	0.00	246 100.0 61	0.001	24.8

TABLE 20.

Prevalence of ansents by daily protein intake.

		5		8					CONTROL OROTO	
		×			Prevalence rate (%)	Mo. K		Ansenic Cases	**	Provalence rate (%)
8			8	3	76.2	3	63 25.6		3	4.4.
.	3	•		ŝ	•	3	3	2	in in	6.61
:		3		3	0.02	8	•		9	9
	1 3	246 100.0 166	13	0.00	5.69	246	100.0	246 100.0 61 100.0	100	*

similar finding have been observed in respect of protein intake values for both the groups (Table 28, Fig. 11). Prevalence rate of anaemia showed a continuous decline with increasing protein intakes. The association between these two factors was statistically significant for study ($x^2 = 7.65$, d.f. = 2, $P \angle 0.05$) and control groups ($x^2 = 17.61$, d.f. = 1, $P \angle 0.001$) separately.



Pregnancy is a physiological process which imposes increased demands of haemopoietic substances to fulfil the needs of growing foetus and for increasing red cell mass in the mother. During pregnancy, in view of high demands of haemopoietic substances, daily dietary intakes usually do not suffice and the needs are fulfilled mainly by a transfer of haemopoietic substances from body stores (Menon, 1967). In case, body stores do not satisfactorily fulfil the demands, a reduction in the haemoglobin level takes place, resulting in anaemia (Sood, 1967).

In India, anaemia is the commonest complication of pregnancy (Menon, 1967). It's high magnitude and widespread ill-effects, on mother as well as on foetus, have attracted the medical researchers and health professionals alike. It is known to be an important factor for high maternal mortality (Menon, 1967; Khanam et al. 1979) and neonatal and perinatal loss. Various workers have shown a positive correlation between maternal hemoglobin level and foetal birth weight (Yusufji et al. 1973).

Although a good amount of work has been done on andemia in programt women, in recent years, unjority of

workers have studied 'ensemis in pregnancy', a concept which significantly differs from 'anaemia of pregnancy'. As 'ensemia in prognancy' takes into consideration all types of ensemias encountered during pregnancy. irrespective of it's actiology, it becomes difficult to ascertain the proportion of women in whom ensemia is directly caused or precipitated by pregnancy. Purther, mostly the available studies are hospital based which fail to provide real picture of the problem in the community. Field based studies are very few and those controlled ones are negligible. In fact the problem of anaemia of pregnancy can not be studied in absence of suitable control. Workers who took studies on the subject have considered varied definitions for the diagnosis of anaemia; many of them used considerably low cut-off points for the purpose, thus, underestimating load of anaemia in the population. Further, in view of variability in definition considered, their results cannot be successfully compared. The present literature on the subject also lacks longitudinal studies to enable one to recognize the problem in terms of fresh development of the condition.

The present study is a controlled, community based and longitudinal study undertaken in a fural population under innate settings. All 246 available relevant pregnant women of the considered area were

studied and equal number of non-pregnant women from the same area served as control. A random sample from a larger population could not be considered in view of paucity of time and lack of facilities. An universally acceptable definition of anaemia for pregnant women and for non-pregnant controls (w.H.O., 1968) was utilized for the process. Our results can, thus, easily be compared with other studies, within and between countries, undertaken in similar population. Further, since the entire investigation was carried out by author only, the results of the present study have relatively lesser observational error.

EXTENT OF THE PROBLEM OF ANAEMIA.

The overall prevalence of ensemia, in pregnant women, based on initial survey was 68 percent; it was 69 percent, based on total observations - initial as well as those of follow-up. As prevalence of ensemia often increases with gestational age (Shanker, 1962; Solomons et al., 1962; Mehrotra et al., 1965; Chopra et al., 1967), the higher rate in latter case is obvious because it had relatively higher proportion of women with advanced pregnancy.

Our results on provalence rates in pregnant women are similar to many other workers (Subramanian and Fernandes, 1970; Oupta <u>St. 61</u>, 1973; Luweng and Oupta, 1979).

Such results give an idea on load of anaemia in pregnant wemen, they themselves, however, do not indicate the extent of anaemia directly caused by pregnancy. Such an observation can be made only when the rates are compared with those observed for corresponding controls. The provalence of anaemia in the non-pregnant women was 25 percent only, indicating that in about 43 percent of women, anaemia was either directly caused or precipitated by pregnancy.

vith the advancement of pregnancy, being 26 percent in first trimester, 67 percent in second and 76 percent in third trimester. This indicates that considerably different prevalence rate would be observed for women belonging to different trimesters of pregnancy. It is, thus, important to emphasize that extent of problem of anaemia, in the two groups of pregnant women, cannot be compared unless they are homogeneous in respect of atleast gestational age. Our findings, on prevalence of emacmia by trimesters, are in agreement with those observed by shanker (1962); Paintin (1962) and Mehrotra et al (1965) who also observed an increase in the prevalence of anaemia with the advancing pregnancy.

The mean bacmoglobin levels in study and control groups were 10.2 go. percent and 12.3 go. percent respectively. Indicating that a reduction of about 2 go.

percent in their hasmoglobin level was because of their pregnancy. Yusufji stal (1973) also observed a mean hasmoglobin level of 10.4 gm. percent and 12.2 gm. percent for study and control groups respectively. Similarly, Chopra stal (1967) observed a mean hasmoglobin level of 10 gm. percent and 12 gm. percent for study and control groups respectively.

Mean hacmoglobin level showed a consistent
fall with enhancing duration of pregnancy being 11.4 gm.
percent, 10.5 gm. percent and 9.7 gm. percent for first,
second and third trimesters of pregnancy respectively.
Our findings closely coincide with those of Shanker (1962).
Solomons at al (1962), Mehrotra at al (1965) and Chopra
et al (1967) also reported a significant fall in the mean
hacmoglobin level with the advancement of pregnancy.

vas highest in both the groups - study and control. The distribution of various types of anaemias in the two groups indicate a widely prevalent iron deficiency in them. Macrocytic hypochromic and macrocytic normochromic anaemias were found in study group only, indicating that the deficiency of Vit. B₁₂ and folic acid play a significant role during pregnancy. A high prevalence of iron deficiency anaemias has been shown by many others (sood, 1967; Apte, 1967; Mc.Fee, 1973 and Luwrang, 1977).

A high prevalence of megaloblastic ensemia has been reported by Kothari and Shende (1952), Karthigaini et al (1964) and Mehrotra et al (1965). However, these results can not be strictly compared with our findings in view of differences in selection of women in the study sample and method adopted for determining the type of amaemia.

All the anaemic women were categorised into 3 groups, depending upon the severity of anaemia (Appendix III), vis. mild, moderate and severe. In the present study, 35 percent pregnant cases had mild anaemia, 54 percent had moderate and 11 percent had severe type of anaemia. In control group, 46 percent anaemic cases showed mild anaemia while 50 percent and 4 percent had moderate and severe anaemia respectively.

aince the definition for diagnosis of ensemia differs from one worker to the other, there is a wide variability in the criteria considered for categorisation of anaemic cases according to the severity. The comparisons of present findings with others is, therefore, not possible.

It was observed that normocytic normochromic pattern was present mainly in mildly ensemic cases whereas mecrocytic ensemis was found in moderate and severely assemic cases. Sood (1967) also opined that in

early iron deficiency, the changes in red cells, if any, are not usually marked, and by the result the blood picture; seems to be normal.

Anaemia situations in a community are usually studied with the help of prevalence rates. Such a rate, though undoubtedly, very important, particularly in the studies like present one, fails to give an idea on number of non-enaemics who turned to the enaemic state afresh in a specified duration of time. With this in view, incidence rates for different trimesters were also worked-out for pregnant women. Such rates showed an increasing trend with the increase in duration of pregnancy. Overall gross and net incidence rates in the pregnant women were about 30 percent and 44 percent respectively.

Tyongar and Apte (1970) in a similar longitudinal study observed an incidence rate of 41 percent. However, the criteria for diagnosing anaemia was 10 gm. percent and not 11 gm. percent as in our study.

In study group 46 percent and in control group,

13 percent anaemic cases complained of some symptoms.

Among non-anaemics, 30 percent had some symptoms in

study group against 5 percent in control group. General

weakness was found to be the most common symptom followed
by giddiness in all the groups. Majority of woman had

more than one symptoms. Chopra <u>et al</u> (1967) reported 50 percent of the examined women to have one or the other symptoms. He found weakness and dissiness to be the most common. Vijayalakshmi <u>et al</u> (1975) found about 51 percent pregnant women to complain general weakness, fatiguability and vague bodyaches. Mehta (1976) was of the opinion that symptoms like easy fatiguability and giddiness etc. are non-specific and have no relation with haemoglobin level.

in 81 percent of anaemic women in study group against
67 percent in controls. Pallor was present in all the
cases who showed positive signs. Koilonychia was found
in 13 percent and 3 percent anaemic cases in study and
control group respectively. In study group, cedema and
congestive heart failure were detected in 10 and 5 percent
anaemic cases respectively. In control group, none of
the women showed the presence of these two signs.

Rusuffi <u>95.81</u> (1973) reported glossitis in 19
percent etometitis in 7 percent, hollowychis in 8 percent
and codema in 11 percent cases. In present study higher
percentage of pregnant women were found to show positive
signs as compared to non-prognam women, probably because
of bigher nutsitional demands during prognamory.

SOCIO-ECONOMIC FACTORS AND AMAENIA.

Socio-economic factors such as literacy status, occupation and monthly per-capita family income play a significant sole in deciding the prevalence of anaemia in a community. Though, such factors have been studied by many workers (Vijayalakshmi <u>et al</u>, 1975; Sarna, 1976; Luwang, 1977) but results are divergent. Study of association of anaemia with socio-economic factors was, thus, thought to be essential.

No significant association could be observed between prevalence of anaemia and religion. This is, probably, because majority of women in both the groups were Hindu. No women came from other religions except Muslim, that too only a few.

significant influence on the prevalence of anaemia.

As the castes were divided into 2 broad groups non-schedule (excluding backwards) and schedule castes
including backwards, the association of individual
castes with anaemia could not be studied. Lawang (1977)
also did not find any significant difference in prevalence
of anaemia in different caste groups. Chopra at al (1967)
observed in Trinidad that race of the pregnant women had
no significant influence on the incidence of anaemia.

Land of the time that the terms of the second

between prevalence of ensemia and main family occupation in either of the groups. It seems that the ratio of earning and dependent members in a family may be more important than family occupation in this regard. Moreover, the occupation studied here was family occupation and the occupations of individual women; the latter may show significant association with ensemia. In our study, the individual occupation were not considered for the purpose as majority of women in the two groups were house-wife and representation of rest other occupation was very poor.

Literacy status is one of the important factors determining socio-economic status of the individuals. In the present study, illiterate prognant women had significantly higher prevalence of anomia in the two groups than those who had had some formal school education. Our findings are in confirmity with those of Luwang (1977). Probably women with some formal education were more conscious of their health and were less biased towards harmful taboos and practices prevalent in the rural communities. The influence of other factors such as - socio-economic status and income can not be ruled out in this regard.

The provalence of anaemia showed a significant fall with the increasing literacy status of the husband

in the study group. However, in control group, no such significant association could be observed. It could have been probably because the literate husbands took a better care of their wives during pregnancy than illiterates and were more receptive and cooperative for health care programmes, organised by the government and other social welfare agencies.

In order to study the socio-economic status of women, families of respondents were divided into 5 social classes as suggested by Prasad (1970). Criterion on social classification of Indian families by Prasad is based on per-capita income. Thus, the considered criterion would in fact, reveal the association of two factors jointly - family income and family sive, with anaemia. Socio-economic status of an individual is the most important factor affecting the diet as well as health care in all the individuals in a community.

prevalence rate of anaemia decreased

significantly with enhancing socio-economic status;

it was highest in social class V, in both the groups,

many other workers (Kothari and Bhende, 1949; Das Gupta

and Chatterjee 1953; Raut and Panda, 1972) have also

observed considerably higher prevalence of anaemia in

lower socio-economic groups.

Andrew Committee (1984)

Part distribution

and the state of t

DEMOGRAPHIC PACTORS AND ANARNIA.

Demographic factors like age of the women, age at marriage, age at consummation and at first child birth, parity and spacing are important correlative factors of anaemia in a community. Many of them are inter-related and are governed by the local customs, traditions and culture of the society. The study of effect of these factors on provelence of anaemia, if any, is extremely important for planning preventive measures in the community.

prevalence of anaemia with the increase in age of the women, so far so, that all the prognant women belonging to the age group of 35 years and above were anaemic.

A similar trend was observed in control group as well.

This could have been, perhaps, due to the increasing hardships of life with advancing age. It might have also been due to effect of parity, which also increases with age. Findings of the present study are in agreement with Ganguli (1954) and Miller et al (1959).

Sarly marriages and their consummation make the woman more liable to become prognant at an early age. Such woman, later on often have a higher parity than those in whom ages at marriage and/or consummation have been delayed. This adversely affects physical growth and development of a woman and renders her more prome for amounts.

In the present study, prevalence of anaemia decreased significantly with increase in age at marriage in study group; but in control group, no significant association could be observed. However, when age at consummation was taken into account such an association become significant in both the groups; control group also showed a decrease in prevalence rate with increasing age at consummation. Comparison of our findings with other workers and further discussion does not seem possible as literature on it is very scanty.

Age at first child birth was found to be significantly related with assemia in study group. The prevalence of assemia decreased with increasing age at first child birth. However, in control group, no significant association could be observed between these two factors. The high provalence of assemia in pregnant women, who gave birth to their first child at an early age, might be due to the fact that in early age, mutritional demands are already high due to growth and development of body organs. In pregnancy, besides this, demands are further increased for the growth of feetus. This leads to significant exhausion of hasmopoletic stores rendering the women more prope for assemia in successive prognancies.

Parity of the woman was found to be significantly associated with the prevalence of anaemia in both the groups. She prevalence rate showed a consistent increase

with increasing parity. Highest rate was observed in women who had parity 5 and above. Many other workers (Leon and Blazer, 1965; Todd and Kan, 1965; Yusufji Stal, 1973; I.C.M.R., 1974) have brought forth similar findings. It is due to the fact that depletion of haemopoietic substances in each pregnancy results in exhaustion of body stores; this is more so if these pregnancies are closely spaced.

Duration of menstrual phase was found to have no significant effect on the prevalence of amounts in study as well as in control groups. These findings are in agreement with those of Luwang (1977). It may, therefore, be concluded that normal individual variations of menstrual cycles, in terms of days of bleeding, do not effect the heemstological status of a woman.

The prevalence of ansemia of pregnancy showed a declining trend with the increase in space between last child birth and present conception. Similar observations have been made by Luwang (1977), who reported a significantly higher prevalence rate of ansemia in woman with the space being less than 12 months, in between two pregnancies, than those who had relatively larger such space. This is because the ucman who has a larger space, in between two pregnancies, get better restoration of hasmopoietic reserves than those with smaller space.

A study, carried out by I.C.M.R. (1975) has also shown that repeated closely spaced pregnancies led to a progressive depletion of iron stores.

LACTATION AND ANASHIA.

The period of lactation is another period of nutritional strain, for a women, efter pregnancy. In India, prolonged lactation (in excess of one year) is quite common specially in the rural communities. One may therefore, expect some effect of lactation on health status of women, particularly anaemia.

Present study revealed that prolonged breast feeding to last child has no significant effect on the prevalence of anaemia, in study as well as control group. The findings contradict the results of Todd and Kan (1965) who observed that prolonged breast feeding plays a significant role in causation of anaemia. It may, however, be noted that the study conducted by Todd and Kan (1965) was a hospital based study conducted in urbanites, while present study was conducted in ruralites where women giving prolonged breast feed were mostly those who had a sufficiently long space between two successive prognancies. As the prolonged spacing has a proven favourable effect in reducing the prevalence of anaemia; it mullifies the deleterious effect of prolonged lactation if any.

The observed difference in two studies may, therefore, be bucause of varied breast feeding practices in them.

As some women continued breast feeding to the last child in initial months of their present pregnancy. Its effect on prevalence of anaemia was also studied. A significantly higher prevalence rate of anaemia was observed in women who continued breast feeding during present pregnancy than those who did not. However, the duration of breast feeding, during present pregnancy was found to have no significant impact on the prevalence of anaemia. This supplements that our former observation, that breast feeding during the present pregnancy has a positive bearing, was perhaps because of the shorter space between the last child birth and present pregnancy and it was certainly not due to the duration of breast feeding.

DIETARY FACTORS AND ANAENIA.

Diet is the only source of supply of most of the essential haemopoietic substances. It, thus plays a significant role in deciding the haematological status of an individual. The prevalence of annexis may thus thought to be associated with dietary habits and quality of dietary intakes.

In the present study, it was observed that majority of woman in the two groups were vegetarian and amongst those who were non-vegetarian, number taking frequent non-vegetarian diets was almost negligible. No assessment could, thus, be made for the difference in the prevalence of anaemia in vegetarians and non-vegetarians.

In community studied the average dietary pattern indicated that the inteless of various food components, except cereals were considerably lower than that recommended by Indian Council of Medical Research (Gopalan et al. 1971).

Intake of cereals, roots and tubers was found to be higher in non-pregnant women while intake of milk and milk products were higher in pregnant women. The lower intake of food by pregnant women was, perhaps, due to the symptoms like nausea, vomiting, loss of appetite and dislike for food, which are quite common during pregnancy. Many workers (Shankar, 1962; Singh et al. 1971; Vijayalakshmi at al. 1975) have reported a poor dietary intake by pregnant women in different parts of India.

significantly lower in anomics than non-absenics in both the groups, clearly indicating that the prevalence of anomia is effected by the distary intoke of cereals. the hasmopoietic nutrients was lower in study group than in control group; and in anaemics than in non-anaemics in both the groups. Average calorie intake was found to be 1,506 Kcal and 1,615 Kcal for pregnant and non-pregnant woman respectively. Vijayalakshmi et al (1975) observed a mean energy intake of 1,503 Kcal in pregnant woman belonging to lower socio-economic status. Shanker (1962) in such woman reported that average Kcal consumption varied from 1,390 to 1,650 depending upon the duration of pregnancy.

Passicha (1958) observed a considerably higher daily calorie intake (1,900 Keal.). However, the composition of population studied in respect of gestational age was significantly different than ours; there were only 3 percent woman belonging to first trimester when the food consumption is said to be low. Moreover, his subjects might be belonging to a comparatively better socio-economic status than those of present study.

The everage daily protein intake in study group was found to be 55 gm. against 59 gm. in control group. The protein intake observed in present study are almost minilar to that reported by Chopra gt_al (1967).

intake of protein from different parts of India (Shanker, 1962; 40 gm.; Gopalan et al, 1969, 37 gm.; Vijayalakshmi et al, 1975, 36 gm.; Singh et al, 1971, 72 gm.). The intake of protein depends mainly on the type of cereal consumed in a community, and socio-economic status of the individuals and may, thus, differ from one population to the other. Although the protein consumption in present study seems to be approaching to that recommended by I.C.M.R. (Gopalan et al, 1971), its large portion is wasted in calorie production, due to deficient calorie intake, and as such, can not be utilized as bedy building food. Moreover, being mainly derived from vegetable sources, the protein is of low biological value.

The prevalence of anaemia showed a considerable decline with increasing protein intake in both the groups. Our findings are in agreement with Sarna (1976) and Lawang (1977).

the average intake of total iron was found to be 48 mg. in study group against 52 mg. in corresponding controls. Shanker (1962), Gopalan (1967) and Sood (1967) have emphasized that the average Indian diet seamingly contains adequate amount of Iron. However, almost whole of it was derived from vegetable sources, mainly careals.

having high phytate contents which lowers the availability of iron for absorption. Moreover, the calcium content of the diet was also found to be very low; this again lowers the absorption of iron. Apte and Venkatachalam (1962, 1964, 1965) have also reported that the high phytate and low calcium contents in the Indian diet restrict the availability of iron and also inhibits its absorption.

The prevalence of ensemia showed a significant decline with increase in dietary intake of iron. Dawn (1973) also observed a similar significant association between daily iron intake and various grades of ensemia in prognant women.

the role of deficiency of folic acid, as a definite entity in the causation of anaemia of pregnancy has been stressed by many workers during recent past (Copalan, 1967; Memon, 1967; Yusufji et al, 1973). However, the literature on the distary intake of folic acid in the communities and that, showing its association with the prevalence of anaemia or otherwise is very scanty.

the average intake of free folic acid, in the present study, was found to be 57.6 µg. in study group and 64.7 µg. in control group; these value are very low in comparison to those recommended by I.C.M.R. (Gopalan et al. 1971). The prevalence of anomia showed a

significant decreasing trend with increasing intake of folic acid in both the groups. Lawang (1977) has also reported similar findings.

in pregnant and non-pregnant women, indicates the proportion of pregnant women in which ensemia has been directly caused or precipitated by pregnancy. It also bringsforth many factors as correlative factors of ensemia. The results of the present study are undoubtedly more precise than many other studies done on the subject in view of many reasons indicated earlier. Our conclusion, can taken to be true for all those populations commensurating in nature with present woman.

CONCLUSIONS AND RECOMMENDATIONS

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CONCLUSIONS.

Pollowing broad conclusions can be drawn from the observations of the present study.

- 1. The overall provelence of anaemia amongst pregnant women was 68 percent against 25 percent in non-pregnant women. Thus in about 43 percent women ensemie was either directly caused or precipitated by pregnancy.
- 2. The overall not incidence rate of anaemia in the area was 44 percent; this envisaged that on an average, about 44 percent of pregnant women developed anaemia afresh during a period of 3 months.
- increase with increasing duration of prognancy;
 this indicates that provalence rates of anamia in
 two populations cannot be compared unless they are
 homogeneous as regards their gestational age.
 However, universally acceptable definition of anaemia
 is undoubtedly a basic need for such comparisons.
- 4. Migrocytic hypochromic ensemis was the commonst type encountered in both the groups showing that iron deficiency played a major role in causation of

anaemia. However, in study group macrocytic anaemia was also found in Sew cases indicating that Solic acid and Vit. B₁₂ deficiency were also responsible, to some extent, for the causation of anaemia in pregnant woman.

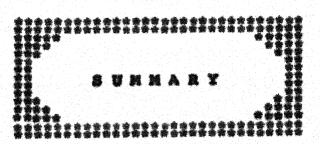
- 5. Socio-economic fectors literacy status of the women and social class, have considerable bearing on prevalence of assemia. Literacy status of husband also effects it in the pregnant women.
- 6. Demographic factors age of the women, age at consummation of marriage and parity play a significant role in the prevalence of anaemia in pregnant as well as non-pregnant women. Pactors like age at marriage and age at first child birth were significantly associated with anaemia in pregnant women only. Spacing between last child birth and present pregnancy too significantly affected it.
- Prolonged lactation has no significant effect on the provalence of assemia.
- 8. The diet of a woman is an important factor in deciding the prevalence of example. The prevalence rate decreases with increasing intake of ison, folic acid and protein.

RECOMENDATE ORS

Following recommendations can be made on the basis of conclusions, derived in the present study.

- 1. The elderly and multigravide prognant women as well as those having short space between last child birth and present prognamcy, should be given priority in ansemia control programmer an attempt should be made to cover all such women specially during later half of their prognamcy.
- Role of nutritious diet, prepared from locally available cheep food articles, should be emphasized to all the prognant woman of child bearing ages.
- 3. Mass education should be provided to stop early marriages in the community, ages, at marriages and at consummation, should be enhanced to avoid early pressancies.
- 4. Role of planned family, in prevention of assemia, should be emphasized in family welfare programmes.

As most of these factors affect the prevalence of amounts in non-prognant woman too, the measures auggested will improve the hasmoglobin level of all the woman of child hearing ages in general, thus reducing their susceptibility for amounts in successive prognancies.



Control Karakes and

Anaemia is one of the important preventable health problems affecting the women of child bearing ages. It is notorious for its deleterious effects during pregnancy, on mother as well as on foetus. It is often associated with high maternal and foetal mortality, besides morbidity.

Ansemia is a pathological condition in which the heemoglobin level is reduced, below the normal limits for age and sex of the individual. The term 'ensemia of prognancy' is somewhat different from that of ansemia in pregnancy; the former takes into consideration only those types of ansemia which are directly caused for precipitated by pregnancy while the latter includes all the types irrespective of its actiology.

In view of graveness and high magnitude of the problem in rural prognant women, a longitudinal study on anaemia was undertaken under domiciliary conditions in a rural community of district Jhansi (Uttar Pradesh) with the following objectives.

 To find out the extent of problem of anaemia of pregnancy in the erea considered.

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- 2. To investigate the association of various socioeconomic and demographic factors, lactation and distary habits with the prevalence of ensemia, if any.
- 3. To suggest some measures, based on the conclusions of the study, for the control of ansemia of pregnancy in the area.

A total of 346 pregnant women belonging to different trimesters of pregnancy were studied for the purpose. An equal number of non-pregnant women, belonging to same socio-economic status, parity and age-group, acted as control.

control were subjected to a detailed examination consisting of general interrogation, history taking, general and systemic examination, hasmatological investigations and diet survey. In women initially belonging to first and second trimesters of pregnancy, a follow-up survey was also conducted, at an average interval of 3 months, to study the hasmatological changes and incidence rate of anaemia. A prognant woman was considered to be anaemic when she had her hasmoglobin level below 11 gm. percent; a cut-off point of 12 gm. percent was, however, considered for non-pregnant woman (W.H.O., 1968). The findings of the study may be summarized as under a

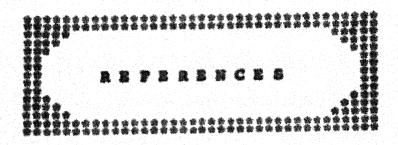
- 1. The overall prevalence rates of anaemia were
 68 percent and 25 percent in pregnant and nonpregnant women respectively. This indicated that
 in about 43 percent women, anaemia was directly
 caused or precipitated by pregnancy.
- 2. Pollow-up investigation of women belonging to early pregnancy, revealed an overall net incidence rate of 44 percent, indicating the extent of afresh development of this condition in pregnant women during a period of about 3 months.
- 3. The provalence as well as incidence rates of amaemia showed an increasing trend with advancing prognancy; the highest prevalence rate being in women belonging to third trimester. It indicates that for comparison of prevalence of anaemia in 2 groups of pregnant women, the groups need to be homogeneous in respect of gestational age. Of course, the criteria adopted for the diagnosis of maemia must be uniform.
- A. Microcytic hypochromic anaemia was commonest amongst verious norphological types prevalent in the area in the two groups. It indicates that the majority of comes were suffering from anaemia due to iron deficiency. A small percentage of prognant women who were anaemic showed macrocytic changes too indicating that folic acid and vit. By deficiencies also play home role in the causation of anaemia of prognancy.

- 5. Amongst the socio-economic factors, literacy and social status of the women were found to be significantly associated with anaemia in the two groups. Literacy status of husbands had a significant role in the determination of anaemia in a population.
- 6. Prevalence of anaemia in both the groups increased with the increasing age of the vomen. It was higher in women who had relatively early ages at consummation and were multigravidae. Prevalence of anaemia among pregnant women was also significantly affected by age at marriage, age at first child birth and space between last child birth and present prognancy.
- 7. Prolonged breast feeding to the last child was found to have significant effect on the prevalence of ansemia neither in study nor in control groups.
- 8. Dietary factors showed a significant role in the determination of prevalence rates of anaemia in the two groups. Such a rate showed a consistent increase with increasing inteke of iron, folic acid and Vit. B₁₂.

On the basis of the findings portrayed above, some recommendations may be made for effective control of ensemis in population commensurating in nature with the present one.

- The vulnerable group of pregnant women wis. elderly, multigravidae and those with short spaces between last child birth and present pregnancy should be given priority in anaemia control programmes, an attempt should be made to cover all such women specially during later half of their pregnancy.
- Role of nutritious diet, prepared from locally available cheep food articles should be emphasized to all the women of child bearing ages,
- 3. Mess education should be provided to stop early marriages in the community; ages at marriage and at consummation should be enhanced, as far as possible, to avoid early pregnancies.
- remily welfare programme should lay down emphasis on the role of planned femilies in reducing the prevalence of ensemis.

Most of the socio-economic and demographic factors studied by us influence the prevalence of anaemia in non-prognant women also. Thus, it is expected that by adopting the recommendations, mentioned above, the hosmoglobin level of all the women of child bearing ages would improve thus making them less susceptible for anaemia during successive prognancies.



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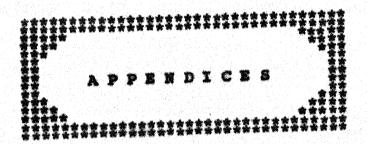
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APPENDIX X

AN EPIDEMIOLOGICAL STUDY OF AMARMIA OF PREGNANCY IN A RURAL POPULATION OF PRIMARY HEALTH CENTRE KOCHHARMANNAR, DISTRICT JHANSI, UTTAR PRADESH.

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<u>Examination and investigations</u>

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	8. Cyanosis
	10. Oedema
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Alama Race	- Oedema / Pollar.
Eves	- Paller / Jaundice.
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AND THE PROPERTY OF THE PROPER	oo of mouth - Paller / Patechae on palate.
Tenes.	- Oedema / scarlet or raw / atrophic papillee.
<u>Quid</u>	- Spongy bleeding / hypertrophy.
Thyroid	- Enlarged / nodular.
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APPENDIX II

SCHEDULE FOR DIETARY SURVEY

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APPENDIX III

Severity of Anaemia

Criteria used for labelling mild, moderate and severe ensemia in the two groups are as follows.

Mild 10.0 - 10.9 11.0 - 11.9 Moderate 8.0 - 9.9 9.0 - 10.9	Severity of ancemia		M) Study	IN LEVEL (gm.%) Control group		
Moderate 8.0 - 9.9 9.0 - 10.9	Mild					
	Moderate		a.o	9.0 - I	10.0	
Severe <u>/ 7.9</u> <u>/ 8.9</u>						